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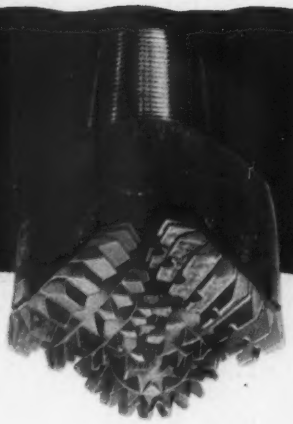

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51 PORTER "REFINERS"

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PORTER
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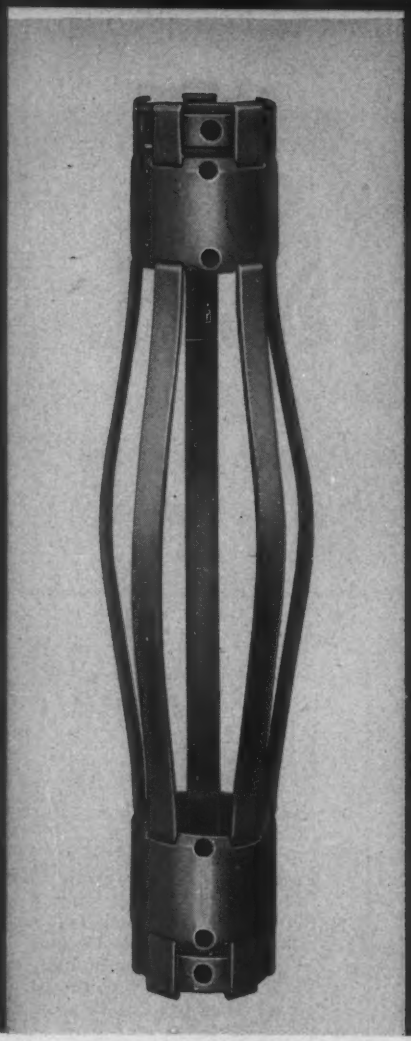

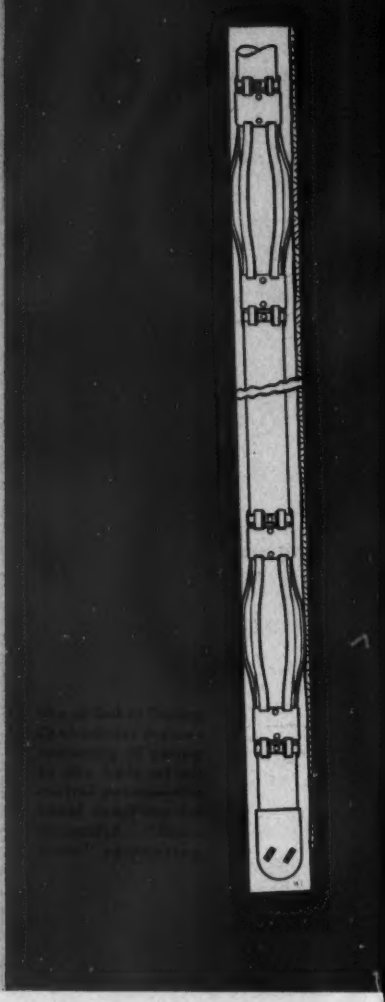

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THE OIL AND GAS JOURNAL

Cotton Valley

AFTER two months it is apparent that the suit filed by the Department of Justice against the Cotton Valley Operators Committee in June has cast a legal shadow over similar projects. In fact, all unitized activities regardless of type are involved.

There are those who profess to have confidence in the announcement of the Attorney General that the suit does not attack "any activity which is necessary or essential to the conservation of natural resources or the prevention of waste." But actions speak louder than words, and the record in recent cases involving oil and gas is not a comforting one to operators who hitherto had thought that today's practices had a sound legal base.

When the Interstate gas and the tidelands suits found their way to the U. S. Supreme Court last year they also were dubbed "special suits," of little importance to oil and gas producers generally. It is now realized that the decisions rendered in these cases in recent weeks were body blows designed to strengthen federal controls and weaken state regulatory authority and private operation. The scope of the final decisions far exceeds the issues involved in the original suits.

Cotton Valley was a pioneer in unitized cycling operations. The legal background and engineering features of the project have been described in the Journal from time to time. Every operating development was checked by the Louisiana Department of Conservation and approved by officials. It is agreed that these unitized operations have added many millions of barrels of recoverable crude oil in a field where otherwise there would have been major waste and inadequate returns to most operators.

But the Justice Department ignored the state conservation laws and the fact that every phase of producing and manufacturing is intrastate in exactly the same manner as are thousands of other operations. The Government alleges violation of federal acts based on interstate commerce.

Apparently there is no objection to the operation up to and including the recovery of distillate, the product of cycling. But the processing of the distillate into finished products and their disposal is said to constitute restraint of trade. In brief, a group of producers can combine their properties in the production of raw material, but it is wrong for these same operators to refine and distribute their products from a jointly owned plant, although these manufacturing and marketing operations are on a voluntary basis with each operator free to proceed as he sees fit.

The future of unitization is dependent on operators being assured the largest possible returns from joint activities. Sound operating practices under a competent joint management have been made effective at Cotton Valley, with full protection to everyone concerned. It is hoped that the case can be adjudicated quickly to the end that operators engaged in or planning unit operations can know where they stand.

New Shell-Texas Line to Increase Middle West Crude-Oil Supplies

by Paul Reed

A $22,000,000 pipe-line project has been announced by Shell Pipe Line Corp. and The Texas Pipe Line Co. for the purpose of providing facilities to increase movement of crude oil northward from the Southwest to Illinois to meet the growing demands for petroleum products in the Middle West.

The new system will be 500 miles long and will consist of 439 miles of 20-in. from Cushing, Okla., to Wood River, Ill., and 61 miles of 16-in. from Wood River to Salem, Ill. The capacity will be 150,000 bbl. daily.

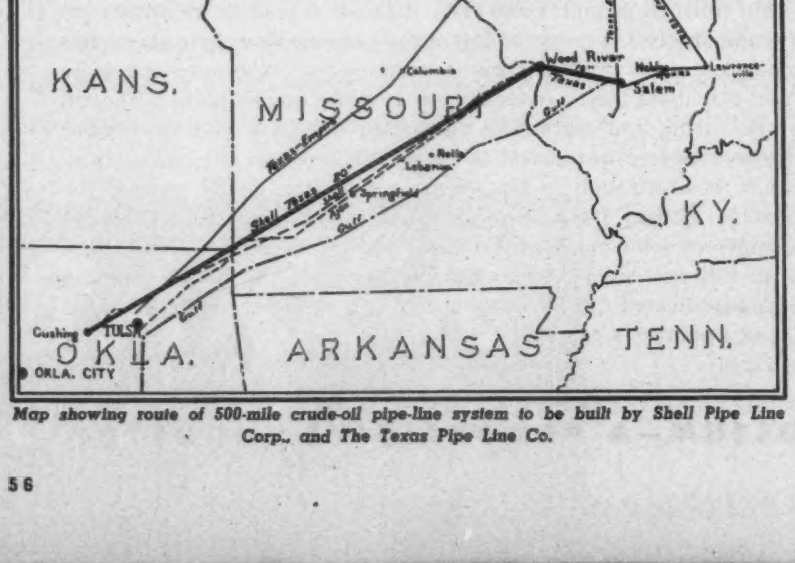
The 20-in. segment will be owned by Shell Pipe Line Corp. and The Texas Pipe Line Co. in undivided interests of 52 per cent and 48 per cent respectively. The 16-in. segment will be owned 100 per cent by The Texas Pipe Line Co.

The new line will provide transportation beyond Cushing for part of the throughput from the recently announced 20-22-24-in. pipe line from the West Texas-New Mexico area to Cushing which is to have a throughput of approximately 190,000 bbl. daily, for which construction is to start in October with completion scheduled for November 1948. (See page 144.) This line from the Permian basin into Cushing will be built as a joint-ownership project in which The Texas Pipe Line Co. and Shell Pipe Line Corp. are participants.

In making the announcement, R. B. McLaughlin, president, The Texas Pipe Line Co., and T. E. Swigart, president, Shell Pipe Line Corp., stated that the new line will provide economical transportation for large volumes of crude oil which will assist materially in supplying refineries of the Midwest area so that they can operate at maximum capacity to meet the increasing consumer demand.

Construction is to start as soon as materials can be obtained. Completion is scheduled for the early part of 1949. According to present plans the new line will be constructed and operated by Shell Pipe Line Corp. The 20-in. line to Wood River will parallel Shell's existing double 10-in. trunk line from Cushing; on the new line there will be five pump stations to be located at station sites common to those now operated by Shell.

This 20-in. line will terminate at the Shell Oil Co., Inc., refinery at Wood River. The 16-in. segment will connect with existing facilities of The Texas Pipe Line Co. in the Salem, Ill., area which include a 10-in. line to the company's refinery at Lawrenceville, Ill. The system has a 26,000-bbl. daily capacity from Salem to Clay City and 48,000-bbl. daily capacity from Clay City to Lawrenceville. In that area there are also the lines of Texas Empire Pipe Line Co. including the Salem-Heyworth, Ill., 10-in. line with a capacity of 20,000 bbl. daily and the Lawrenceville-Heyworth 8-in. line rated with 12,000 bbl. capacity. It is assumed that these existing facilities will be expanded. The new project of Shell Pipe Line Corp. and The Texas Pipe Line Co. will be operated as a common carrier.



Map showing route of 500-mile crude-oil pipe-line system to be built by Shell Pipe Line Corp., and The Texas Pipe Line Co.

Other Projects

Other large projects under way to increase crude-oil transportation from the Permian basin and other producing areas in the Southwest to the Middle West refining areas include the following:

Magnolia Pipe Line Co. is now engaged in laying the Corsicana, Tex.-Patoka, Ill., 650-mile 20-in. line which will have a capacity for delivering 100,000 bbl. daily to the trunk line of Socony-Vacuum Oil Co., Inc., at connections in the general Salem area. In recent years the Magnolia company has been steadily increasing the capacity of Midland-Corsicana pipe-line facilities.

Stanolind Pipe Line Co. is carrying on a program begun more than a year ago for increasing flow from the Permian basin to Chicago. This includes the looping of its Drumright, Okla.-Whiting, Ind., system with 632 miles of loops of various sizes of large-diameter pipe. Last year and this year Stanolind has laid approximately 326 miles of 20-in. loops to carry out the looping plan. Last week Stanolind let contracts for 187 miles of 20-in. and 22-in. (See page 144.) With the completion of this looping late this year, Stanolind will have laid 513 miles of the main-line looping program. Stanolind's 1947 capacity into the Wood River area is reported to be 58,000 bbl. daily; future expansion is said to provide for 5,000 bbl. additional capacity.

Into the Whiting, Ind., area, Stanolind's 1947 capacity has been given as approximately 139,000 bbl.; future increases would mean that it would be raised at least 67,000 bbl. to a total of 206,000 bbl. by 1951.

Stanolind also plans to increase the throughput of its 16-in. outlet from the Permian basin to Drumright, Okla., from 86,000 to 126,000 bbl.

Fuel-Oil Consumption Has Slight Increase in June

Fuel-oil consumption of electric-utility power plants in June totaled 3,273,323 bbl., an increase of 0.3 per cent over the consumption of last month and a 14.8 per cent increase over June of last year, the Federal Power Commission reported.

I.O.C.C. Economics Committee Calls For Capacity Operation by Industry

Presented here are excerpts from the report of the Economics Advisory Committee of the Interstate Oil Compact Commission, made at the August 11-13 meeting in Great Falls, Mont. Following the over-all report are brief sketches of the outlook for each district.

CAPACITY operations by the industry for some time into the future will be required to supply the large and rapidly increasing demands for petroleum products. Extraordinary measures to move additional supplies into District 2 will be needed to prevent shortages in that area next winter. Crude-oil production and refinery crude runs of about 5,160,000 bbl. daily will be required, at least through March, to meet demand. Even higher operations would be helpful in building up stocks to levels that would facilitate distribution and provide some margin of safety against the possibility of an unusually cold winter or other unforeseen developments that may increase demands above the levels estimated by the committee.

Demand

The present supply problems are caused by an unusually large growth in demand and by lack of adequate transportation facilities from producing to consuming areas, since supplies are greater than ever before. Domestic and export demand this year will be about 5,800,000 bbl. daily, or 9 per cent greater than in 1946. These estimates take into account the lastest United States military requirements and exports of 440,000 bbl. daily, which equal anticipated imports. During the first quarter of 1948, when peak winter requirements develop, the committee estimates that demand will be 6,165,000 bbl. daily, on the basis of normal weather and a moderate recession in business activity.

The rapid growth in demand for kerosine and distillate fuel oils for heating in winter makes it necessary for the industry to take unusual measures to meet requirements for these products. It will apparently be necessary for refineries to achieve larger yields of distillate fuel oils than ever before, and for stocks to increase rapidly during the next few months. Even then, transporting supplies to the right points will be a major problem.

Supply

The industry's capacity to produce and refine crude oil is adequate to meet the demands now anticipated for next winter. Committees of the National Petroleum Council have estimated that in the United States the maximum efficient capacity to produce crude oil is 5,271,000 bbl. daily and that refining capacity is 5,643,000 bbl. daily, including the capacity of some shutdown plants.

Immediately, therefore, the industry's problem does not arise from a shortage of supply or from inadequate refinery capacity, but from a lack of facilities to move oil from areas with additional available capacity, such as West Texas and the Rocky Mountains. If demand continues to increase at a rate of 5 to 10 per cent annually, however, the industry will be faced with the major problem of developing adequate supplies of (1) additional drilling and imports, or (2) the manufacture of liquid fuels from natural gas, coal, and oil shale.

Transportation

The most serious problem now existing is that of moving supplies in sufficient quantities into District 2. Pipe lines are being operated at capacity, and substantial movements by tank cars at high cost are already being made. The present rate of deliveries still does not appear adequate. Extraordinary efforts to increase tank-car and barge movements into the Midwest will be required promptly if demands are to be met fully next winter, for winter conditions will reduce the quantities that can be delivered by tank cars, barges, and pipe lines.

The industry has under way a number of pipe-line projects to move more oil into District 2, but little relief will be secured from such construction until 1948. Such projects should be expedited to the maximum extent so that the transportation situation will be improved as soon as possible, and certainly before the winter of 1948-49.

Additional tanker transportation from the Gulf Coast to the East Coast will also be required next winter. It is understood that sufficient tankers can be made available for the anticipated movement, although this may require that some tankers now inactive be returned to service by next winter.

Stocks

Stocks of crude oil and the four major products in the United States were about 10,000,000 bbl. higher at the end of July than a year ago, but the change has not been uniform by areas. In the Pacific Coast area, stocks were 10,700,000 bbl. higher; in District 2 stocks were about 16,-

UNITED STATES PETROLEUM SITUATION
(Thousands of barrels)

		1947					1948
	1946	Actual	Estimated	Forecast			1st. Q.
Demand:	Year	1st Q.	2nd Q.	3rd Q.	4th Q.	Year	prelim.
Gasoline	2,138	2,005	2,375	2,450	2,265	2,274	2,080
Kerosine	268	393	245	215	360	303	410
Distillate fuel oil	746	1,130	705	630	1,015	870	1,250
Residual fuel oil	1,333	1,557	1,375	1,285	1,480	1,425	1,550
Other	836	832	955	1,025	920	933	875
Total demand†	5,321	5,917	5,655	5,605	6,040	5,805	6,165
Domestic demand	4,907	5,496	5,165	5,155	5,640	5,365	5,765
Exports	414	421	490	450	400	440	400
Supply:							
U. S. oil production*	4,749	4,796	5,050	5,160	5,160	5,042	5,160
Natural gasoline	321	352	350	355	365	356	370
Imports	370	482	430	425	410	437	440
Total supply	5,440	5,630	5,830	5,940	5,935	5,835	5,970
Stock changes:							
Four major products	+99	—355	+77	+412	—79	+14	—244
Refinable crude oil	+16	+50	+66	—65	—15	+8	+60
Others	+4	+18	+32	—12	—11	+8	—11
All oils	+119	—287	+175	+335	—105	+30	—195
Closing stocks (million barrels):							
Four major products	222	190	197	235	227	227	205
Refinable crude oil	225	229	235	229	228	228	233
Others	60	62	65	64	63	63	62
All oils	507	481	497	528	518	518	500
Crude runs to stills	4,760	4,800	4,925	5,200	5,165	5,023	5,130

*Forecast shows amount required to meet demand and maintain stocks. †If transportation or other causes prevent delivery of the needed petroleum products, the actual consumption may be reduced accordingly.

000,000 bbl. lower; and in Districts 1, 3, and 4 stocks were about 15,000,000 bbl. higher. These comparisons reflect the difficulty encountered in moving adequate supplies into District 2 and indicate the serious situation which exists in that area.

The committee's forecast indicates a small addition of 3,000,000 bbl. to petroleum stocks during the 9 months ending next March. Such a change can only be accomplished by large additions in the third quarter, since stocks will be reduced during the following 6 months by heavy winter demands. The stock level shown at the end of next winter is about 4 per cent higher than on March 31, 1947, but that is about the minimum that could be considered adequate in view of the increasing demand and the tight situation existing in stocks of kerosine and distillate at the end of the first quarter of this year.

EAST COAST

(Comprising Atlantic Coast states from Maine to Florida, but excluding western Pennsylvania and New York.)

Present indications are that the demand for all products for the year 1947 will exceed 1946 by about 13 per cent in this area. A much greater than average increase is anticipated for all fuel oils, and particularly for home heating and diesel oils. Refineries will be called upon to make a much greater proportion of light fuel products. Tankage for all fuel oils should be filled to the maximum during the fall of the year. Consumers' tanks should be filled during the summer and before the heating season. Even if this is accomplished, the district may find its stocks of middle distillates and fuel oils at very low levels by the following spring as a result of the heavy winter demands. Gasoline stocks may be very low at the end of this summer. In order to provide for the demands for 1948 it appears that these inventories should be built up to tankage capacity by the end of the first quarter of 1948.

DISTRICT 2

(Ohio, Kentucky, Tennessee, Indiana, Michigan, Wisconsin, Illinois, Missouri, Oklahoma, Kansas, Iowa, Nebraska, South Dakota, North Dakota, Minnesota.)

Supplies of gasoline have been inadequate to meet all requirements. Restrictions will continue through August and should tend to ease in subsequent months of 1947. However, the extent of the easing of restrictions on gasoline will be conditioned by the magnitude of the shift of yields from gasoline to kerosine and distillates. This analysis indicates that a sharp shift of yields will be necessary if the industry is to approach meeting the peak winter requirements.

Stocks of kerosine and distillates at the end of July 1946 were proven to be inadequate last winter. Today's inventories 21 per cent below last year's, and facing a substantial increase of demand, may prove to be more seriously inadequate during the coming winter. Present efforts to bring greater quantities of crude oil and finished products into the Midwest are remarkable. An analysis of requirements for the next 9 months indicates that an even greater flow will have to be accomplished if demands are to be met fully.

One basic point is that local production of crude oil has declined sharply since 1941. Total District 2 production of crude oil has fallen from 1,200,000 bbl. daily in the closing months of 1941 to a current level of approximately 950,000 bbl. daily. Furthermore, consumption has increased during the same time period by approximately 375,000 bbl. daily. The decline of local production plus the requirements of an expanded market have placed an increased load of 625,000 bbl. daily on transportation facilities. The transportation system thus far has proved to be inadequate.

In order to make available additional tank cars for assignment to District 2 service, it will be necessary for units of the industry throughout the nation to place as large a proportion of product movement as possible on truck transports or in product pipe lines. In spite of the utmost efforts of the industry, transportation facilities may not be secured in adequate quantities to meet demand fully in District 2.

DISTRICT 3

(Texas, New Mexico, Arkansas, Louisiana, Mississippi, Alabama.)

Crude-oil production requirements over the last half of 1947 and the first quarter of 1948 call for maximum efficient rates, increased effort to develop new sources of supply, and expansion of transportation facilities.

Currently, the district is producing about 3,000,000 bbl. of crude oil daily. In order to meet local and interregional demands projected for the next 9 months, it will be necessary to increase production of crude oil in a level of at least 3,050,000 bbl. daily.

Refinery crude runs during the first half of 1947 averaged 1,764,000 bbl. daily. Currently, runs to stills are at the rate of about 1,950,000 bbl. daily. In order to meet the demand projected over the next 9 months, it will be necessary for all refineries in the district to operate at maximum capacity. Additional units under construction and utilization of some shutdown units may permit refiners in this district to process more than 2,000,000 bbl. of crude oil daily during the period under consideration.

Since about two-thirds of the supply moves out of the district, the expected increases, if realized, will prove of material aid in alleviating supply shortages anticipated.

It should be realized, however, that any increase in available supply from District 3 must be accomplished by adequate transportation facilities. In fact, shortages that have thus far been experienced in District 2 have been due largely to a combination of lack of supplies and inadequate transportation facilities.

DISTRICT 5

(California, Oregon, Washington, Arizona, and Nevada.)

It appears that District 5 is in a position to meet the anticipated demands for petroleum products over the period covered by this report. Total demand in District 5 in 1947 is not expected to reach as high a level as that attained during the war while California fields exclusive of Elk Hills are now producing more oil than during the war.

Despite large increases in demand, District 5 has been about to maintain crude-oil production and refinery output at levels sufficient to increase materially both crude oil and products inventories.

Compact to Ask Congress To Give States Tidelands

Following an appeal by Gov. Beauford Jester of Texas the Compact adopted a resolution calling on members to "unite in proposing and supporting enactment of suitable legislation at the next session of Congress for the purpose of acknowledging and affirming ownership of submerged lands and resources to the respective states in accordance with the heretofore long-recognized constitutional rights of the states."

In other actions the Compact selected Oklahoma City as the site of its annual meeting, to be held December 4-6, and approved creation of an advisory committee from the oil industry to further secondary-recovery research.

The new committee will be known as the Advisory Committee on Secondary Recovery. Membership will be announced soon. Paul D. Torrey, consulting engineer of Houston who has been prominently connected with secondary recovery work for several years, has been retained as consultant to aid the new committee in its work.

P.E.I. Government Terms Products Public Utility

Following announcements of an impending shortage in petroleum products, the Prince Edward Island provincial government has declared all petroleum products used for heating and fuel purposes a public utility.

Plans are under way for creation of a board to control sales and supplies.

this week

REFINING— Nation's refiners promise Government and military leaders military fuel requirements will be met. . . . Ask military forces to establish central agency to coordinate procurement and estimate future needs. . . . ¶Sunray gets title to Beckett, Okla., refinery from WAA. . . . Company to remodel plant and build pipe line. . . . ¶Shell sets next summer as completion date for $10,000,000 lubricating-oil plant. . . . ¶Stanolind announces contract covering sales of byproducts of proposed synthesis plants. . . . ¶Imperial buys White Horse refinery, announces plan to move it 1,350 miles to Edmonton to refine Leduc field crude. . . . ¶Continental awards contract for 7,500-bbl. refinery at Billings, Mont. . . . ¶WAA reveals sale of Richmond, Calif., aviation-gasoline plant to Standard of California.

PIPE LINE— Shell Pipe Line Corp. and Texas Pipe Line Co. announce joint project to build 500-mile crude-oil line from Cushing, Okla., to Wood River and Salem, Ill. . . . Line will carry 150,000 bbl. daily and cost in excess of $22,000,000. . . . Completion scheduled for 1949. . . . ¶Specifications being prepared for West Texas-Cushing, Okla., big-inch crude line by four major companies. . . . Contracts to be let in September. . . . ¶Stanolind Pipe Line Co. awards contracts for main-line looping program. . . . ¶Contracts let by Tennessee Gas Transmission Co. for 400 miles of looping construction. . . .

PRODUCTION— Production of crude oil sets all-time record in week ended August 16. . . . Output averaged 5,165,175 bbl. daily, 41,880 bbl. daily above previous record and 51,535 bbl. daily above previous week. . . . ¶World's deepest producer completed by The Texas Co. in Queen Bess Island area of Jefferson Parish, Louisiana. . . . Production is through perforations at 13,879-13,904 ft., slightly deeper than Shell Oil Co., Inc.'s Weeks Island field producer. . . .

INTERNATIONAL— Sinclair Oil Corp. spuds wildcat on Colon Island, Panama, in ceremonies attended by Panamanian and U. S. military officials. . . . ¶Chile announces Spring Hill field production will be refined without help of foreign companies. . . . ¶Russia submits new proposal for control of Iranian oil through joint company. . . . Observers expect early action by Iran Government. . . . ¶Shell group announces huge expansion program, including plans for Europe's largest refineries to be located in England to process Middle East crude. . . . Statement declares expansion essential in spite of high construction and other costs. . . .

EXPLORATION— New pool opener in Duval County, Texas, produces 150 bbl. oil per day from pay at 1,770-85 ft. . . . ¶American Republic Corp. well in Wurtsbaugh area, Tyler County, opens new pool. . . . ¶Texas Co. completes world's deepest producer in Jefferson Parish, Louisiana, making 49 bbl. condensate and 6,000,000 cu. ft. gas from perforations at 13,879-13,904 ft. . . . ¶Mallieu field, Lincoln County, Mississippi, gets 1 1/2-mile extension. . . . ¶Nine drill-stem tests between 10,100 ft. and 10,562 ft. get important oil recoveries in East Lindsay well, McClain County, Oklahoma. . . . ¶World's deepest test, Superior Oil Co. 51-11 Weller, Caddo County, Oklahoma, abandoned at 17,823 ft. . . . ¶Shell Oil Corp. confirms discovery of new deep producing zone in Signal Hill field, California. . . . Seventh consecutive producer in Leduc field, Canada, makes 204 bbl. oil in 6 hours. . . .

Typifying the efforts of the oil industry to supply the products-hungry Midwest is this Mississippi River tow carrying more than 120,000 bbl. of gasoline and other products. With a capacity of a good-sized ocean-going tanker, the tow measures 834 by 96 ft. and is composed of six barges. Each of the four end barges has one raked end, increasing the speed of the tow. Built for Standard Oil Co. of Ohio by Ingalls Shipbuilding Corp., at Decatur, Ala., the barge above operates on Mississippi and Ohio Rivers. Clear deck areas and low curb on five of the six barges enable operator to haul deck loads when not carrying oil. (Photo courtesy Ingalls Shipbuilding Corp.)

International

WORLD-WIDE OIL DEVELOPMENTS

Shell Group Plans Huge Expansion Program in Spite of High Costs

Timely comment on conditions in the oil industry throughout the entire world as well as a report on his company's activities are contained in the statement by Sir Frederick Godber, chairman, at the annual meeting of The "Shell" Transport & Trading Co., Ltd., one of the largest international oil companies associated with the Royal Dutch-Shell group. The accompanying report is taken from the annual statement.

IT will be appreciated that the scale of all capital expenditure is now very largely in excess of the cost of similar construction before the war. Indeed, our experience shows that it amounts to three or four times the prewar cost. Whether these costs will materially decline or not during the next few years is largely a matter of conjecture, but it is a point which the managing directors of the group have had to consider.

They reached the conclusion that the world demand for their products was such that notwithstanding these high costs they must proceed with their plans, and that the world cannot be starved of oil on the ground that in a few years' time costs might decline. It will be realized that as a result of our large responsibilties in this vitally important field, we shall over the next few years be called upon to find large new sums of money for these projects.

You will have seen recently references in the press to an agreement between Gulf Exploration Co. of the United States and our group, which over a period of years calls for the sale and purchase of large quantities of crude oil by us from Kuwait in the Persian Gulf. I believe this contract is one of the most important and one of the largest ever made in the history of the oil industry.

From the group's point of view it represents a substantial addition of security and strength for the marketing outlets which we have created all over the world.

I have already hinted at the effect which increasing prices for materials and equipment must have upon our financial resources.

I have told you that notwithstanding this, the group has not hesitated to go ahead with plans for expansion. The conclusion of the contract with our American friends, with the expansion which it will necessarily call for, must obviously make a further considerable demand upon our financial resources, but here again the managing directors of the group are satisfied that the investment so involved is justified.

Meeting Increased Demand

You may have seen in the press references to the difficulties which have arisen in meeting the still rapidly increasing demand. I am confident that the oil industry can meet this demand—certainly over a long-term period, although the next year or two in particular may present difficulties. There are vast reserves of petroleum, many as yet untouched, but to make this petroleum available to the consumer requires above all else steel. The short-term difficulties of steel are well known, but the oil industry's requirements of steel I think are well appreciated by those responsible for its production, as is also the fact that if steel is not forthcoming immediately the ability of the British oil industry to meet this growing demand will be seriously prejudiced

Before new reserves can be brought into production there may be periods of shortage in petrol, diesel oil, and fuel oil. The still rapidly growing demand for oil in the United States already means that even if dollars were available the oil industry outside the United States cannot depend on supplies from that country to meet its marginal requirements. Nor can South American production cover the whole of deficits arising. That is why the greatest importance is attached to the rapid and efficient development of other possible new economic sources of crude-oil supplies, including those from the Middle East.

Refining

Although we still believe that in normal circumstances and conditions the proper and economical situation for all but specialized refineries is at or near the source of production, world conditions are not now normal, and we are finding it increasingly necessary to widen the distribution of our refinery facilities. Demand is increasing rapidly and production must keep pace with it; it is clear that world production and refinery capacity are at present inadequate to meet world demand. New refineries must therefore be planned at once and built as soon and as quickly as material will permit.

In considering the location of the new refineries, we have realized that main sources of crude-oil supply are changing, and have recognized that the prolific fields of the Middle East are taking an important part and will continue to take an even greater part in supplying the petroleum requirements of Western Europe, and that refineries in the Caribbean clearly cannot economically handle crude oil from the East. Our new refining capacity, therefore, must be so sited as to be available for dealing with all the sources of supply now coming into sight. This points to Western Europe.

You will realize that it is much quicker to erect great new plants in a country whch is already highly industrialized such as the United Kingdom.

In all these circumstances I do not think you will be surprised to learn that we have decided to erect refineries in this country, which, in addition to being the most complete units, will have a capacity in excess of the largest yet erected in Europe.

Research

Our growing chemical interests are based upon work done in the group's research centers at Thornton near Stanlow in Cheshire, at Amsterdam at those of Shell Development Co. at Emeryville, in California.

At Thornton our Aero Engine Laboratory has been reoriented to peacetime needs, and it is here that problems set by the gas turbine are studied, as well as those that arise in the effort to meet the demand for still better fuels and lubricants for aircraft.

At Houston, Tex., our associates are building a new research laboratory, devoted to scientific problems of oil exploration and exploitation. In Holland rapid recovery has taken place and research at the Amsterdam laboratory at Delft is being actively pursued.

The Fleet

We have continued our policy of replacement to such good effect that at the end of 1946 the tonnage was 1,487,000 deadweight tons. This is still slightly below our tonnage at the outbreak of the war, but when all the ships at present on order are delivered to us the tonnage of our fleet will greatly exceed it.

We have on order 16 vessels of 159,000 deadweight tons. The group has purchased a number of American tankers of the T-2 type. Their deadweight is approximately 16,000 tons each. Further to supplement present and prospective tonnage requirements and to provide essential flexibility in operation our prewar chartering policy has been continued.

Russian-Iranian Oil Showdown Expected

An immediate showdown on Russian proposals for control of Iranian oil was forecast in Teheran early this week.

Radio Moscow reported a draft agreement covering organization of a proposed Soviet-Iranian oil company has been presented to the Iranian Government by the Russian ambassador.

Following a closed meeting of the Iranian parliament, a cabinet member told press representatives Premier Ahmed Qavam had demanded an immediate settlement of organizational differences in preparation for a vote on the Russian proposal.

Under the tentative agreement reached April 4, 1946, while Russian troops were still in the country, a joint Russian-Iranian company, controlled by Russia, would be set up.

American Army officers reported 3,000 Russian troops were massed south of the Caucasus early this week.

Sinclair Panama Starts Colon Island Wildcat

Sinclair Panama Oil Corp., jointly owned by Cities Service Oil Co. and a Sinclair Oil Corp. Venezuelan subsidiary, Venezuelan Petroleum Co., has begun drilling on its wildcat on Colon Island, off Bocas del Toro, Panama.

The company was granted a concession covering nearly 18,000,000 acres in Panama about 7 months ago. Since then it has been conducting exploratory work and moving in equipment.

In spudding-in ceremonies by Panamanian officials, representatives of the U. S. Department of State, and Army and Navy officials, the drilling machinery was started by M. de J. Quijano, finance minister, representing Panama's president Enrique A. Jimenez.

Loan Sought to Improve Two Venezuelan Ports

Preliminary negotiations for a private loan of $25,000,000 to be used for construction of new port facilities in Venezuela were being conducted in New York this week by Dr. Manuel Perez Guerrero, minister of finance for Venezuela.

Venezuela, whose oil royalties are now about $130,000,000 annually, now has $200,000,000 in dollar balances, including gold reserves.

The proposed construction would involve La Guaira, port for Caracas, and Guanta. The contemplated improvements would require about 2 years.

The new construction is part of government plans for increasing its international trade, particularly imports, and to improve internal economic conditions.

Bolivian Government Approves Contracts

Contracts for construction of a pipe line from Tin Tin to Cochabamba and for the erection of refineries in Cochabamba and Sucre have been approved by the Bolivian Government.

The government also has authorized the signing of a contract for the extension of the pipe line from near SZ Zudanes to Sucre.

International

Guatemalan Concession Granted, Reports Say

The local firm of Stapper & Osborne, S. C., has been given an exploratory concession covering 500,000 hectares (about 1,200,000 acres) in the southeastern corner of the Peten, near Lake Izabal, in Guatemala, according to the Office of International Trade of the Department of Commerce.

Reports from American service officers to the department indicate the area is favorable for production by relatively shallow drilling.

Spring Hill Output to Be Refined by Chilean Unit

Production of Chile's Spring Hill field in the Tierra del Fuego Archipelago will be refined by a Chilean concern, Corporacion de Fomento de la Produccion, government oil agency, has announced.

The agency flatly denied reports that output of the field, which already has six producers with two more rigs drilling, would be turned over to a Standard Oil Co. (N.J.) subsidiary for refining.

The corporation said equipment for a refinery will be purchased in the United States, Great Britain, and Switzerland. The government previously has been reported planning construction of a 10,000-bbl. refinery at either Punta Arenas or Valparaiso.

Dutch Gasoline Dump Fired by Dutch Saboteurs

Five thousand cans and drums of gasoline were destroyed at Port Tandjoengpriok, Java, when the main dump of the Netherlands Indies Petroleum Board was swept by a fire believed by Dutch authorities to have been set by saboteurs.

According to a Dutch army communique, Pangkalanbrandan and nearby oil storage facilities in north Sumatra were fired.

Trans-Arabian Draws Funds

The first $25,000,000 of its $125,000,000 for construction of a pipe line from the oil fields of Saudi Arabia to the Mediterranean has been drawn by the Trans-Arabian Pipe Line Co. The remaining $100,000,000 is to be made available between now and July 1, 1949.

Eastern VENEZUELA — STATUS REPORT ON OPERATIONS

by Kenneth B. Barnes

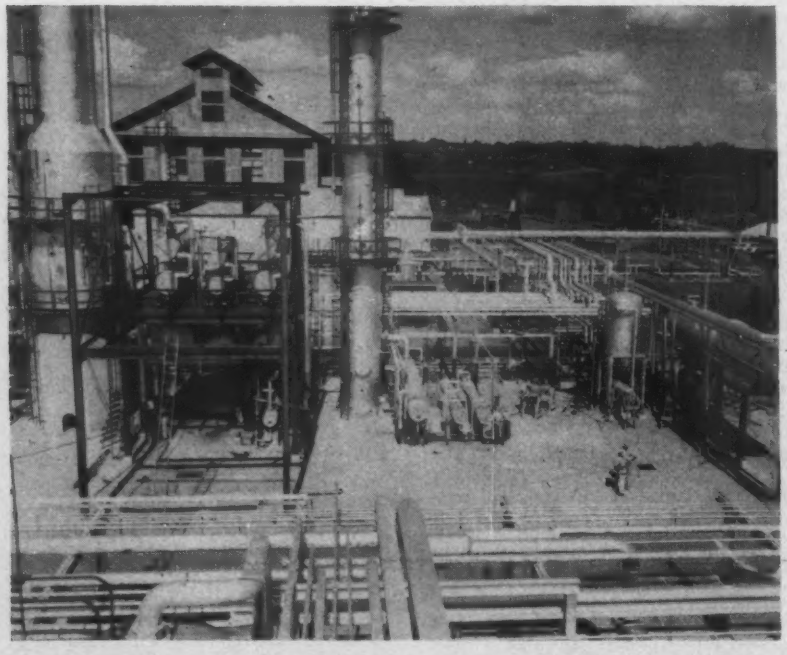
This is a discussion of the most rapidly growing oil area in South America. It tells what the region is like and outlines the principal features of drilling, production, transportation, and current construction activities. A similar account of Western Venezuela was given by the author in the August 2 issue, pages 44-46.

EASTERN Venezuela in a number of its geographical, geological, and oil-production aspects is pretty much like some well-known oil areas in Texas. The states of Monagas and Anzoátegui, which contain nearly all of the presently developed fields, in large part have topography very similar to the West Texas plains country. The terrain is comparatively flat and unbroken by heavy vegetation and trees. In places the tablelands, however, give place to gently rolling topography and arroyo-like erosion features. This description holds for the area encompassed by the horseshoe-shaped swing of the present major fields lying around the edges of the Eastern Venezuela (Maturin or Orinoco) basin—the Greater Oficina area on the south, the San Joaquín area on the west, and Jusepín area to the north.

The climate is relatively equable and mild—at least not tropically hot—because of the prevailing trade winds blowing southwesterly. The rainy season starts gradually along in June. The rains are not continuous nor unduly heavy, and gradually taper off by December. In general, therefore, the weather is a comparatively even-tempered "summer" all the year round.

The oil fields (see accompanying map and chart) produce mostly from Miocene sands. The Eastern Venezuela structures are noted for the many individual pay sands that are "stacked" one above the other. In some fields as many as 40 or more separate producing reservoirs are found, and the aggregate many-layered accumulations in these cases can make for a very rich oil "cake" indeed. The multipay occurrences, producing-depth ranges, opportunities for dual and triple-zone completions, the physical character of the sands and their hydrocarbon contents, drilling and producing conditions, all are like those present in the South Texas oil fields, such as West Ranch, Greta, Agua Dulce-Stratton, Seeligson, Rincon, etc. The proximity of the fields to tanker terminals on the Caribbean also is about the same as that of the South Texas fields to Corpus Christi.

Eastern Venezuela thus in part is like two Texas areas: (1) West Texas in general size and topography, (2) South Texas as to general conditions of drilling and production. Beyond this, however, large comparisons with United States areas cease. The territory Delta Amacuro, which is being actively explored for oil, is low-lying tropical jungle. To the north along the Caribbean weave the coastal ranges, and the large Quiriquire field lies huddled in rolling jungle terrain near some of these mountains. To the west or in Central Venezuela lies the big State of Guárico, another active exploration area and mostly of llanos terrain and intersected by many tributaries of the Orinoco River.



Jusepin field—Construction work at Creole's new "combination plant." Units involved are crude stabilization, desalting, pressure maintenance, 15,000-kw. power generation

Development Now Expanding

Oil production in Eastern Venezuela has had three significant dates. The year 1928 marks the discovery of Quiriquire, the oldest field and the one that has produced the most oil. About 10 years ago marks the advance in development of the large Oficina area and discovery of a few other major fields. The present period is one of further development of fields discovered between 1940 and the present, and a greatly needed expansion of producing facilities.

Up to about 10 years ago Eastern

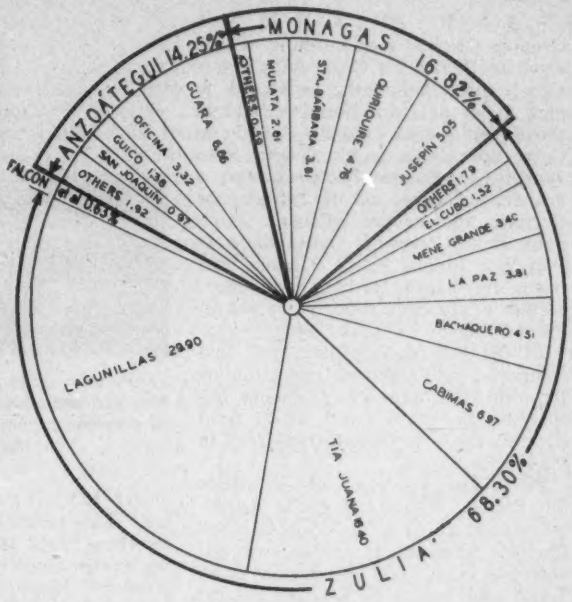
Venezuela was an extremely sparsely developed area. Then there were no railroads (nor are there now), very few highways, and only one or two airports could be counted. There was very little in the way of ocean-terminal installations. Communications were nearly nil.

But the development and expansion of oil production in late years have changed these things. Transportation today in Eastern Venezuela is by two methods. To enter or leave the area (and sometimes for the longer moves within) air travel is used almost exclusively. There are airports at Barcelona, Maturín, Santa Bárbara, Quiriquire (nearby), Anaco and San Tomé. These are variously served on regular schedules by Pan American, K.L.M., Avensa, Taca, Línea Aeropostal Venezolana, and in addition the oil companies use their own planes in many applications.

Puerto La Cruz, adjacent to Barcelona, is the principal port for Eastern Venezuela, and oil-industry supplies mostly are brought in there. It is also the terminal for the big trunk pipe lines delivering crude oil from the interior.

Mene Grande has a trunk line (capacity 180,000 bbl. per day) from the

Cumulative production from the state of Monagas is 426,704,570 bbl., from Anzoategui is 214,980,844 bbl. (January 1, 1947). Last year Eastern Venezuela produced 30 per cent of the country's oil, from 1,303 wells, and the accompanying chart shows the percentage from the major fields. Shallowest field (2,600-3,900 ft.) and lowest-gravity oil (19°) in Monagas is Quiriquire, the others are 4,000 to 6,000 ft. and have 21° to 33° oil. Most of the fields in Anzoategui run 5,000 to 7,000 ft., and the oil is 25° to 43° gravity. Current production from the East is 345,000 bbl. per day. The states of Zulia and Falcon are in Western Venezuela, discussed in the Journal, issue of August 2, pages 44-46



Map of Eastern Venezuela, showing state boundaries, oil fields and location of important test locations

Greater Oficina area running northward to Puerto La Cruz, with a terminal trunk branching eastward to pick up crude from Travieso field in the Jusepín area. Creole Petroleum Corp. operates a trunk system from Jusepín to Puerto La Cruz and a branch also goes to its refinery at Caripito and to the adjacent Quiriquire field. Compañía Consolidada de Petróleo (Sinclair) has a trunk line from the Santa Bárbara and Muri sectors of Jusepín field to its terminal at Puerto La Cruz. Socony-Vacuum Oil Co. of Venezuela has just completed and put into operation its 103-mile 12-in. pipe line (capacity 70,000 bbl. per day) from Guico field (Oficina area) to Guanta (adjacent to Puerto La Cruz).

There also are some other outlets for Eastern Venezuela crude. Quiriquire production is moved to Creole's Caripito terminal on the narrow but deep San Juan River. Production from Temblador moves to Tabasca, a port on the Uracoa River, a tributary to the Orinoco. Tucupita field has tanker outlets on the Manamo River to the Gulf of Paria. Pedernales field, of course, is directly on the Gulf of Paria.

Busy port and terminal—Here at Puerto La Cruz come in nearly all of Eastern Venezuela's oil supplies. In turn, the trunk crude lines of Mene Grande, Creole, Consolidada (Sinclair), Socony-Vacuum load to tanks at this and adjacent points

Recent Plant Installations

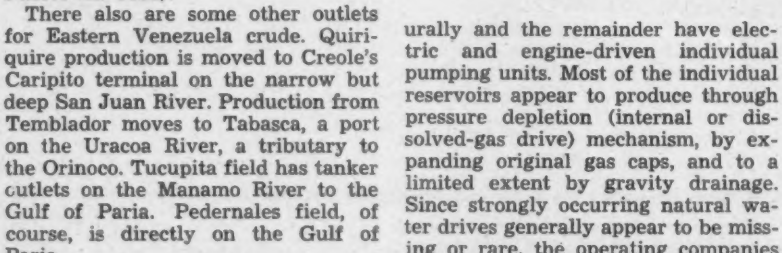
Current Eastern Venezuela production is on the order of 345,000 bbl. per day. So far the area has only about 1,400 producers completed, which makes the current well average about 245 bbl. per day. About 90 per cent of the wells are flowing naturally and the remainder have electric and engine-driven individual pumping units. Most of the individual reservoirs appear to produce through pressure depletion (internal or dissolved-gas drive) mechanism, by expanding original gas caps, and to a limited extent by gravity drainage. Since strongly occurring natural water drives generally appear to be missing or rare, the operating companies have paid much attention to maintaining low gas-oil ratios.

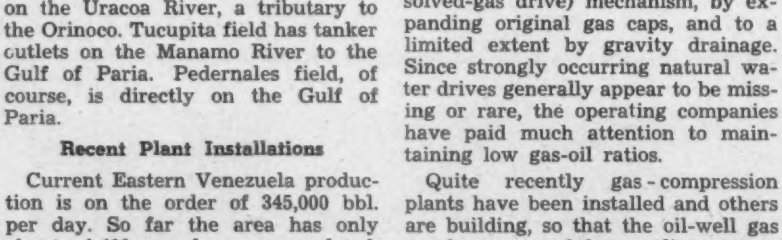
Quite recently gas-compression plants have been installed and others are building, so that the oil-well gas can be processed for gasoline extraction, compressed, and returned to the producing formations. In Santa Bárbara field Compañía Consolidada operates its pressure-maintenance plant which currently is serving 14 gas-injection wells. The plant also entails complete gasoline-extraction and stabilization equipment.

At Jusepín, Creole has nearly completed a large combination plant. The gas injection in its preliminary phase will handle some 10,000,000 cu. ft. per day, gathered from flow manifolds at 250 psi. and boosted to 2,200 psi. by two 800-hp. two-stage units for return to the injection wells. Other parts of the plant include crude-stabilization units to handle 40,000 bbl. daily. The 300° F., 200-psi. pressure coalescer-desalting unit will keep the salt content of the crude to desirable low levels. Another part of the installation will be a large power plant. Two 5,000-kw. steam-turbine-driven generators are now installed and a third unit will be added. These generators are tied in via a 33,000-volt high-line transmission system with the company's 12,000-kw. plant at Caripito. This will result in practically all of Creole's facilities in the area being electrified, including the 60,000-bbl.-per-day refinery at Caripito, the trunk-line crude-oil pump stations, the camps at Caripito, Quiriquire, and Jusepín, the 3,600-hp. gas-repressuring station at Quiriquire, and the various processing units at the Jusepín plant itself. Three 85,000-lb.-per-hour boilers will furnish the 400-psi. steam. A somewhat similar compression and stabilization plant is being considered for Mulata field.

Mene Grande at West Guara (Oficina area) has under construction a repressuring plant which will include six 800-hp. compressors. Plant design will permit gas injection to 1,800 psi., boosting in three stages. Condensate produced interstage will be stabilized to 21 lb. R.v.p. for transmission to the crude pipe line, and a 10-lb. prod-

(Continued on page 68)





Above: San Tome (in Oficina area) is Eastern Venezuelan headquarters for Mene Grande Oil Co. Below: At Santa Barbara is main field office of Consolidada (Sinclair)

WASHINGTON WATCHING

BY HENRY D. RALPH

Sour Predictions

WASHINGTON.—The second anniversary of V-J Day was observed by Washington chiefly in reviewing the prophecies which were made when Japan threw in the sponge August 14, 1945.

President Truman confessed that he had expected the world to be at peace 2 years afterward, but he was wrong.

The oil industry anticipated a letdown in demand and a possible surplus of oil; instead it is breaking all records and is still short of meeting consumer requirements.

The steel shortage was expected to be ended virtually over night and permanently; now it appears to be worse than ever.

Serious unemployment was predicted, with a huge government make-work program necessary to provide 60,000,000 jobs within several years; now more than 60,000,000 people are at work without such a program.

Automobiles, consumer goods, and farm products were expected to flood the market in such quantities that prices would fall disastrously.

The list of postwar predictions which went sour could be stretched indefinitely, with considerable merriment to all except the red-faced prognosticators.

But several lessons could be drawn. The most obvious is that basing business plans on long-range forecasts is highly hazardous; maximum flexibility is required to meet day-to-day problems. Another one is that government forecasters don't stand in with the Delphic Oracle one whit better than those on private payrolls.

From which the conclusion might be drawn that government economic planning and inflexible government industrial controls are not necessarily the heaven-sent and infallible solution to the problems of business.

Rationing Probe Planned

RATIONING of petroleum products by the supplying companies is a current business phenomenon which may be investigated by the Joint Congressional Committee on the Economic Report, according to one of its members, Sen. Joseph C. O'Mahoney of Wyoming.

The committee plans to hold hearings this fall on the general subject of rising living costs, and its staff has been compiling preparatory data.

"Evidence before the committee," O'Mahoney says, "shows that the automobile industry, by private understanding, is rationing the output of automobiles. The steel industry is rationing the output of steel. Now the major oil companies are undertaking to ration petroleum products."

The senator added that such distribution programs based on scarcities may not violate the antitrust laws, but that the public will have to accept ratoning either by industry or by Government unless "Congress adopts an intelligent program of stimulating production."

But Department of Justice officials are not quite so sure that this "private rationing" is always free from antitrust violation. It is getting a great many complaints from independent jobbers, city governments, and others who have been cut off from supplies, and it is doing quite a lot of investigating.

It is no violation, department officials concede, for a single oil company, facing more demand than it can supply, to allocate sales on some equitable basis, such as 1946 deliveries plus or minus a uniform percentage. But if a group of companies follow the same plan it would look like a conspiracy in restraint of competition and might be an unreasonable, and therefore illegal, one if it resulted in putting some people out of business. And the officials are not ready to say that this is not the situation today.

Two Aspects Suspicious

There are two aspects of the current "private rationing" which look suspicious to the antitrust enforcers. One is that most of the allocation plans are based on last year's firm contracts and make no provision for customers who bought on a spot or bid basis. As a result, many federal, state, and city government agencies, and many independent dealers, find themselves with a quota of approximately zero instead of getting the same percentage cut as other customers. There is some suspicion that this might be a deliberate plan to force all customers to sign annual supply contracts, thus freezing the business and leaving little room for competitors.

Another development which is being watched closely is the tendency of some majors to ration customers in their normal distributing areas and at the same time expand their marketing activities into new territories, or take on new accounts among users whose former suppliers are short of product. This makes it look as though all companies are not as short of supplies as they claim to be, and it might be constituted the ancient and dishonorable device of "withholding" which the old common law recognized as a method of raising prices and promoting monopoly.

FPC Controls

THE Federal Power Commission is locking the door after the horse has been stolen. If its administrative rule denying jurisdiction over independent gas producers had been in effect at the time it proceeded against Interstate Natural Gas Co., Inc., the natural-gas and oil-producing industry would not have become so aroused as to demand that Congress amend the law.

Actually the new rule does not keep FPC from doing anything it did in the Interstate case. There it set the price at which one interstate pipe-line company could sell gas to another in the field. The new rule retains this authority. What disturbed the gas industry was the fact that the commission's language in the Interstate case suggested that it intended to go further and take jurisdiction over field sales by any producer. And the Supreme Court made it clear that the commission can do just that if the gas eventually moves into interstate commerce.

Now amendment of the act is imperative, and FPC is pledged to support it. When FPC proposed the amendment which became the Priest bill, some skeptics suggested that the commission was simply drawing a red herring across the trail to keep Congress from acting on the more sweeping Rizley amendments. But the formal opinion announcing the administrative rule on production and gathering states the commission's intention to continue to seek clarifying legislation.

The trouble for FPC lies in the fact that when the subject of amending the Natural Gas Act comes up in Congress again it will be politically impossible to confine debate to the single and noncontroversial subject of independent producers and gatherers. With the Rizley bill already passed by the House it is certain that the FPC's proposal will be subjected to many amendments which the commission will not like at all.

It is quite probable that the commission would have been spared this threat of unwanted congressional action if it had not alarmed gas producers many months ago by hinting that it might take a position which it now formally renounces.

Impractical Dissent

THE dissent of Commissioner Claude L. Draper from the action of his FPC colleagues in promulgating the rule exempting independent gas producers from regulation is completely logical and legalistic, but a bit impractical.

He is entirely correct in his arguments that (1) the Supreme Court said Congress intended to regulate all sales of gas for interstate transmission, (2) that only Congress can change the law, and (3) that the commission has no power to fix the limits of its own jurisdiction.

His dissent is impractical for administrative and political reasons. There is probably not a federal regulatory agency in existence which has ever exercised what it considered to be its complete jurisdiction simply because none ever had the men and money to conduct all the investigations and bring all the cases it might like. No law is ever enforced 100 per cent, and for practical reasons every enforcement agency has to ignore what it considers minor matters and concentrate on phases of greatest public interest. More often this self-limitation of jurisdiction is tacit, but it is not unique for an agency to announce that it won't bother with certain kinds of cases.

FPC has a limited budget and a heavy docket of pressing cases. Even without the rule to which Draper objects it is unlikely that it would find time to investigate gas sales by independent producers in the relatively short time before Congress is due to amend the law to make this impossible.

From a political standpoint, if Draper's position had been adopted by the majority of the commission it would have provided a fine head of steam for the advocates of legislation to impose drastic restrictions on FPC's authority. They could have argued that the commission announced its intention to exclude independent production and gathering at a time when congressional opinion seemed ranged against it but changed its tune when Congress adjourned and the Supreme Court ruled in its favor. This could be cited as proof that FPC is not to be trusted.

The majority action in promulgating the rule may be bad law—though there is none to challenge it—but it does show good faith in adhering to a previous policy.

Military Needs

LAST week's meeting between military big brass and representatives of the larger refiners failed to accomplish the objective of either group but made enough progress so that all seemed well satisfied.

The Army and Navy wanted a formal agreement for specific military set-asides before commercial accounts got any deliveries. The refiners pointed out that this is impossible, but individuals, emphasizing that they spoke for their own companies only, promised faithfully to do their share in filling Government orders.

Refiners demanded that the services pool their procurement and estimates so the industry can know what is wanted and cited many examples of difficulties with present methods.

This hit home to the men in uniform, and observers believed it did much good for the topside officials to hear this first-hand. While full unification of the services cannot be accomplished immediately, there were definite promises that petroleum buying will be better coordinated to permit the industry to do advance planning.

The military men did little eagle-screaming and were restrained in explaining the vital importance of filling their requirements, but their statements were impressive. In their turn they became convinced that the industry is not engaged in a conspiracy to boycott the Government.

Antitrust Drive

WITH considerable fanfare, Atty. Gen. Tom Clark announced last week that the antitrust division is preparing to make a big drive against conspiracies to increase or maintain prices of consumer goods, and promised criminal penalties against all violators.

On analysis, however, the announcement boiled down to little more than a statement that the division will pay particular attention to price cases while continuing all other phases of its work, and few observers believed that the campaign would have any appreciable effect on prices generally or would result in prosecution of large number of business firms

Petroleum products were not mentioned in the announcement, and the oil section of the division is going along as it was before Asst. Atty. Gen. John F. Sonnett took charge of antitrust work last May. It is working on a number of "segment suits" carved out of the general charges in the 1940 complaint against the American Petroleum Institute and all major oil companies. Two of these are pending on the West Coast, aimed at the exclusive dealing practices of Standard Oil Co. of California and Richfield Oil Corp., and others are being prepared in various sections of the country. Also pending is a grand jury investigation of charges of fixing gasoline prices in West Coast states.

In spite of these segment suits, which admittedly have not been moving as fast as had been hoped, the department is not ready to drop the old A.P.I. "Mother Hubbard" case, and it is still possible that this may be brought to trial sometime.

From the standpoint of antitrust forces the A.P.I. case has one feature that could not be covered in any number of segment suits. This is the general charge that the two-score major integrated oil companies are so large, and cover so much territory, and do so much business, that they cannot help but dominate the entire oil industry and set the pattern for all and keep on growing bigger and bigger themselves, whether or not they are guilty of any specific violations of the antitrust laws.

Eastern Venezuela

(Continued from page 64)

uct will be made for local motor-fuel usage. The major portion of the auxiliary equipment will be driven by electric motors and power will be supplied by three 675-kva. generators driven by gas engines. In Oficina field, Mene Grande also is building another gas-repressuring plant. This will consist of one 800-hp. unit and dry gas from a high-pressure gas sand (750-900 psi.) will be lifted in one stage of compression to 1,400-1,500 psi. for injection to the oil reservoirs. Consideration also is being given to later adding three more compression units to this installation, after the initial operation gets under way and operating data can be analyzed.

Mene Grande's water flooding experiment in the "B" segment of the L_4 sand of Oficina field also has had successful results. The operation of one injection well has boosted production as much as 700 bbl. per day. Depth of this reservoir is 5,500 ft.

Listing follows of the big oil camps, which have very fine and modern housing and recreational facilities for personnel of the companies operating in this area. As the principal port, Puerto La Cruz, is maintained a pipeline and terminal camp by Mene Grande, and that company also is reportedly now commencing its projected refinery at a site here. General Electric Co. and Williams Brothers Co. also maintain their camps and warehouses at Puerto La Cruz. Eastern division headquarters for Mene Grande, with large-scale camp and warehouses, are at San Tomé. At the nearby Venezuelan town of El Tigre are found the operating points of Halliburton Oil Well Cementing Co., Schlumberger Surenco, and Flint Industries, Inc. Creole has its refinery and Eastern Venezuelan headquarters at Caripito, and extensive district camps are located at Quiriquire, Jusepín, San Joaquín, Temblador and Pedernales. Pantepec Oil Co. of Venezuela, S.A., Venezuela Atlantic Refining Co., and Gases Industriales camps are in the general Jusepín area, Consolidada is at nearby Santa Bárbara, and Phillips Venezuelan Oil Co. is a few miles to the southwest. Socony-Vacuum and United Oil Well Service, Inc., operating points are at Anaco.

Industry Promises Military Needs To Be Filled; Asks Central Buying

WASHINGTON.—Promises that the military requirements for petroleum products will be met, even at the cost of increased civilian shortages in some areas, were given top Army and Navy officials by representatives of some 50 of the largest refiners of the country at a conference August 15 called by Sercetary of the Interior J. A. Krug.

While the Government men asked each refiney to set aside a specific allocation for military needs, the industry representatives did not agree to any specific plan but gave assurances that Government orders would be filled, estimated at about 5 per cent of total consumption.

They countered with the request that a central military procurement agency be established which could coordinate requirements of all branches. The Government officials replied that centralized procurement could not be put into effect until the armed forces are more nearly unified, but promised that in the meantime every effort will be made to improve procurement planning and to keep the industry informed of Government needs.

Program Asked

Secretary Krug, who presided, asked the industry to adopt a specific program which will be effective immediately and in the future to assure filling of Government supply orders, but after the meeting he expressed confidence that the industry would fill these needs though it will mean a tighter pinch on commercial supplies in some areas this winter.

The conference lasted most of the afternoon, and the time was about equally divided between military men explaining their needs and industry men criticizing procurement methods. They pointed out that the Army and Navy had been largely out of the market since the end of the war, while using up stocks, and are now asking large deliveries at a time when civilian demand is at an unprecedented high level.

Assurance was given that the military have pared their consumption to minimum requirements, but the grave need for filling these was stressed by several high-ranking officers.

Chief spokesmen for the industry were Chairman J. F. Drake and other members of the National Petroleum Council's committee on military and government requirements.

The session was held behind closed doors, but the War Department issued a lengthly summary of the discussion.

Operations Reduced

Lieut. Gen. Hoyt S. Vandenberg, deputy commander and chief of air staff, Army Air Forces, declared worldwide Air Forces operations within the past 30 days have been cut to approximately 83 per cent and operations in the zone of interior have been reduced to 75 per cent.

"The immediate fulfillment of our gasoline requirements is not the only serious aspect of this aviation gasoline shortage," he said, "because as a matter of urgent necessity a minimum level of petroleum products should be established and maintained beyond the quantity for training. This will not be possible unless increased offers are forthcoming from the industry."

Secretary of War Royall told the conference Congress has determined that "during this period of disturbed world affairs, our nation must have a military establishment greater in strength and size than at any other time in American peacetime history."

"The maintenance of this large force," he continued, "requires unprecedented amounts of petroleum and petroleum products.

"During the fiscal year 1948, we will need more than 100,000,000 bbl. of petroleum products which, were they to be supplied entirely from our domestic sources, would consume more than 20 days of our total annual refinery output.

"Fortunately we are able to meet about one-fifth of our requirements by purchases abroad." (For discussion see Watching Washington, page 68).

Crude-Oil Production Sets All-Time Record

PRODUCTION of crude oil in the United States set an all-time record during the week ended August 16, with an average daily output during the week of 5,165,175 bbl.

The figure was 41,880 bbl. daily greater than the previous record of 5,123,000 bbl. daily set during the week ended June 21.

The new record followed only a week behind the establishing of all-time records in four other phases of oil operations as the nation's oil industry strained its facilities to meet an unprecedented peacetime demand for petroleum products.

Texas, contributing heavily to the country's total output, also set a new record with a daily average production of 2,306,050 bbl., an increase of 22,550 bbl. over the previous week.

Kansas registered a gain of 17,250 bbl. daily over the previous week, to reach the state's highest production level since August 18, 1943. Kansas output was 300,350 bbl. daily.

Other gains included: Wyoming, up 5,310 bbl. to 121,610; Michigan, up 5,225 bbl. to 47,140; California, up 4,900 bbl. to 925,700; Colorado, up 4,040 bbl. to 44,410; Montana, up 1,160 bbl. to 24,110; and Oklahoma, up 1,150 bbl. to 389,700.

Production for the entire United States was 51,535 above that of the previous week, when the daily output averaged 5,113,640 bbl.

COMPARATIVE FIGURES ON RECENT CRUDE-OIL PRODUCTION

Week ending—	Prod. (bbl.)
August 16	5,165,175
August 9	5,113,640
August 2	5,095,215
July 26	5,094,115
July 19	5,058,420
July 12	5,044,170
July 5	5,079,160
June 28	5,115,635
June 21	5,123,295

Sunray Gets Title To Beckett Plant

SUNRAY OIL CORP. received title August 18 to the Beckett, Okla., aviation-gasoline refinery, on which it was high bidder in a War Assets Administration sale conducted August 4.

Title was awarded in Washington to Floyd L. Martin, Sunray vice president in charge of refining, and Paul E. Taliaferro, vice president and general counsel, following final approval by WAA officials.

Sunray will pay the Government $5,100,000 for the plant, built at a cost of $14,212,000.

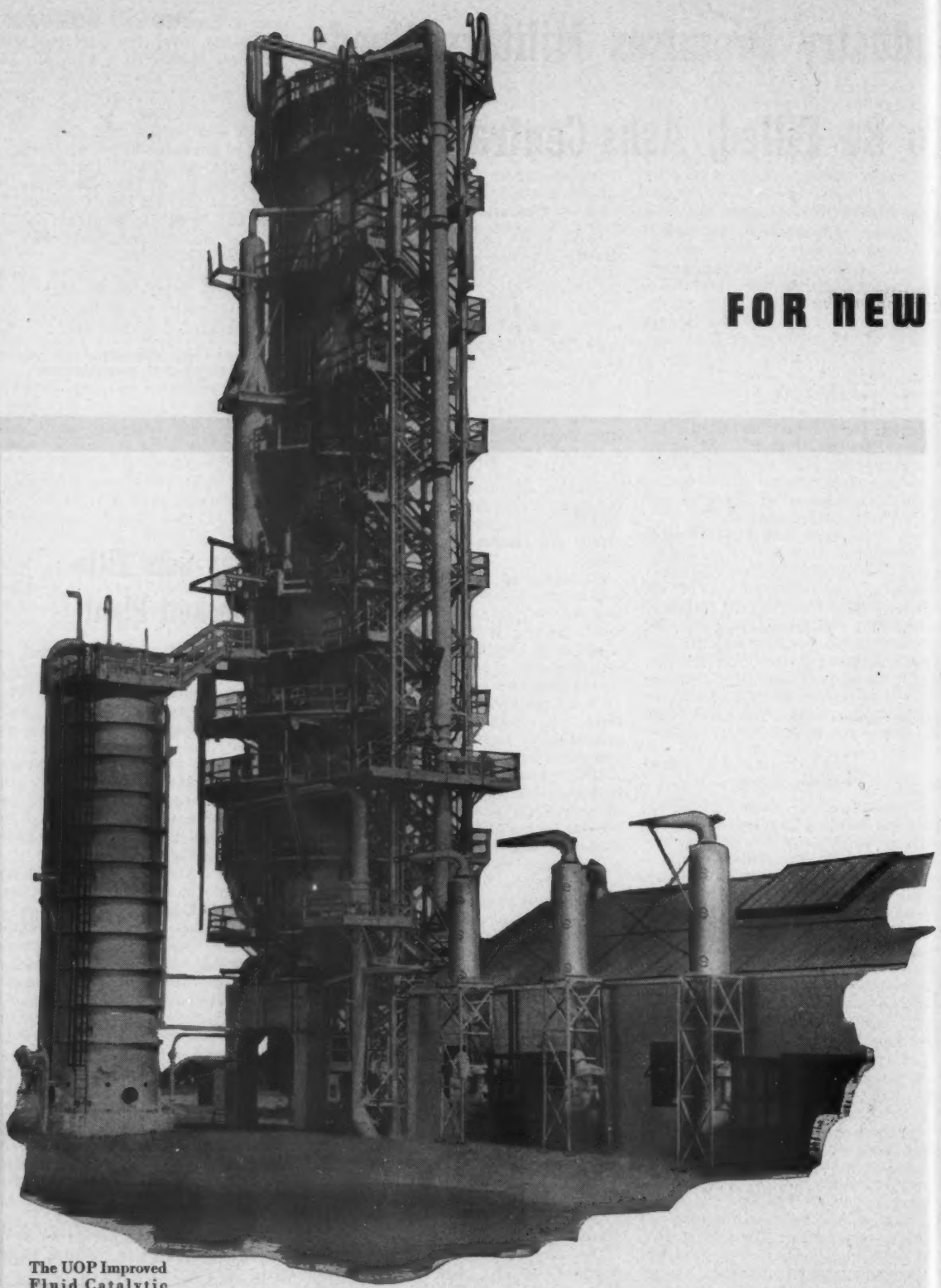
The company already has purchased pipe for a 93-mile 6-in. line between the Beckett plant and Sunray's refinery at Allen and is planning to begin construction upon completion of an aerial map survey. The line and three booster stations are expected to cost more than $1,200,000.

The Beckett refinery consists of a fluid catalytic cracking unit of about 10,000 bbl. daily capacity, and an HF alkylation unit and auxiliary facilities. Sunray plans to completely remodel the plant to provide topping and vacuum distillation capacity of 15,000 to 20,000 bbl. daily at a cost of more than $1,175,000.

The refinery is expected to be on stream within 9 to 12 months, Martin said.

New Oil Company Formed

West Edmond Oil Co., a Delaware corporation, has been issued a charter by the Oklahoma secretary state. The company will maintain its headquarters in Oklahoma City.



FOR NEW

The UOP Improved Fluid Catalytic Cracking Unit now on stream at the Aurora Gasoline Company's Detroit refinery

RESEARCH

PROCESSING FLEXIBILITY

Flexibility . . . minimum operating costs . . . minimum construction costs. For these reasons the Aurora Gasoline Company specified the UOP Improved Fluid Catalytic Cracking Unit shown here. It's on stream at the company's Detroit refinery now . . . guaranteeing competitive ability in the face of rising gasoline octane requirements.

The combination of reactor and regenerator in a single column and the attendant reduction in structure and piping is a design achievement which contributed materially to reduced construction costs. Maximum utilization of Aurora's existing facilities, too, aided in lowering the initial costs. These savings were not made at the expense of processing flexibility or operating essentials, however, for the Aurora unit is designed to process a wide range of charge stocks in various ways to meet changing market demands. Advance design, coupled with a properly arranged utility system, means low operating costs for Aurora.

Other refiners, as well, will find the flexibility and low cost of the UOP Improved Fluid Catalytic Cracking Unit a profitable answer to today's problem of competitive processing.

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FPC Withdraws From Jurisdiction Over Independent Gas Operators

WASHINGTON.—The Federal Power Commission has announced that it will not attempt to regulate sales of natural gas by an independent producer to a pipe-line company for movement in interstate commerce in spite of the fact that the Supreme Court has said that such sales are under its jurisdiction.

It has promulgated a formal administrative rule to this effect, explaining that this will relieve an existing uncertainty regarding the commission's position. The rule is effective immediately.

Notice that it proposed to make such a rule was issued to the industry by FPC on May 27, at the time when Congress was considering legislation to exempt all production and gathering from the Natural Gas Act. On June 16 the Supreme Court announced its decision in the case of the Interstate Natural Gas Co., Inc., which held that any sale of gas destined for ultimate movement in interstate commerce is subject to regulation by FPC. Then the Priest bill (H.R. 4099) was introduced in the House, being substantially the same as the proposed FPC rule, but Congress adjourned without final action on this subject.

FPC Order

The FPC order recited this history and said:

"This brief review of developments has been presented so that there may be no basis for misunderstanding or continuing expressions of fear and uncertainty regarding this matter, which is noncontroversial. The commission gives its assurance to independent producers and gatherers of natural gas that they can sell at arm's length and deliver such gas to interstate pipe lines and can enter into contracts for such sale without apprehension that in so doing they may become subject to assertions of jurisdiction by the commission under the Natural Gas Act.

"The rule herein has this specific purpose and is issued at this time because Congress has not yet reaffirmed such exemption by amending the act. It is also our intention, in keeping with the position heretofore taken, to continue to recommend to the Congress that it take appropriate clarifying legislative action regarding this matter."

The rule exempts from FPC regulation all sales of natural gas by producers who are not affiliated with the interstate pipe-line purchasers, but it still leaves FPC power to regulate the field price of gas produced by transmission companies.

The preamble of this rule states the opinion that Congress did not intend to regulate production and gathering. But the commission foreswears only sales by independent producers, retaining jurisdiction over production and gathering by transporters.

Du Pont To Start Sale Of Tetraethyl Lead January 1

Five district offices have been designated and managers named as plans progress for E. I. Du Pont de Nemours & Co., Inc., to market tetraethyl lead anti-knock compound for motor and aviation fuels beginning January 1, 1948. A complete petroleum chemicals service laboratory will be set up in each district.

Du Pont has been manufacturing tetraethyl lead at Deepwater Point, New Jersey, for the past 24 years. Its present contract with Ethyl Corp. expires at the end of 1947 after which date these anti-knock compounds will be sold direct to the oil-refining industry through Du Pont's expanding petroleum chemicals division.

District headquarters will be established at Tulsa, Houston, Los Angeles, Chicago, and Wilmington, Del. Ray E. Miller is director of sales.

Public Relations Now Industry-Wide Program

IN the 6 months since the public relations program was initiated it "has become an all-industry program," Clarel Mapes, general secretary of the Mid-Continent Oil and Gas Association, told the Interstate Oil Compact Commission in its Great Falls, Mont., meeting.

While the program began with the American Petroleum Institute, he said, it "is being developed through the active cooperation of virtually all segments of the petroleum industry.

Bearing out his report, Mapes said:

In the New York-New Jersey district a speakers' committee of 100 men is being organized. In the New England district the distribution of fact pamphlets is being conducted by the Independent Oil Men's Association and the Retail Gasoline Dealers' Association.

In the Middle Atlantic states 325 companies and 6 trade associations are cooperating in distributing editorial material.

In the Southeast, distribution of editorial matter has been made to 556 jobbers and dealers and 3 jobber associations. Tentative arrangements have been made to designate a "Petroleum Day" at the Texas State Fair. New Mexico, Louisiana - Arkansas, and Mississippi-Alabama divisions of the Gulf-Southwest district are engaged in speakers' programs and in the distribution of editorial material.

The Kansas - Oklahoma committee is working on plans for participation in the International Petroleum Exposition, to be held in Tulsa in May 1948, and the first local advertising program is to be launched at meetings in Tulsa August 27 and in Wichita, Kans., August 28.

Approval Asked For Sale Of 'Biggest Inch' Gas

Southern Counties Gas Co. and Southern California Gas Co. have asked approval from the California Public Utilities Commission of a proposal to move an additional 100,000,000 cu. ft. of natural gas daily into northern California counties to help ease the natural-gas shortage in that area.

The proposal is in the form of a contract between the two companies and Pacific Gas & Electric Co. for sale of the gas to the latter company.

Based on the belief that the new California-Texas natural-gas pipe line will be stepped up to its full capacity of 305,000,000 cu. ft. daily 3 years ahead of the originally planned date for such maximum development, the contract calls for sale of 75,000,000 cu. ft. daily beginning January 1, 1948, and a full 100,000,000 cu. ft. at a later date.

New Waterway Terminal For Chicago Starts Soon

Early September has been set as the starting date for construction of a new petroleum products water terminal for metropolitan Chicago. Completion is expected by December 1.

Three oil supply and distributing firms, Western Oil & Fuel Co., Petroleum Heat & Power Co., and Cities Service Oil Co., will own and operate the terminal.

Storage facilities of three 80,000-bbl. and four 55,000-bbl. tanks to comprise a total 460,000-bbl. capacity estimated to cost $750,000, will be located on a tract of 62 acres on the south bank of the sanitary district canal.

Henry Baskerville, president of Western Oil & Fuel Co., Minneapolis, has been appointed president of the new Waterway Terminals, Inc., which will operate the terminal.

Texas Co. Fluid Cat Cracker Seen As Model of Small-Refinery Planning

THE first small Fluid cat cracker to be built with all new equipment since the end of the war went on-stream recently at the Casper, Wyo., refinery of The Texas Co. It will manufacture premium motor fuel for distribution in the Rocky Mountain area. Rated at 4,000-bbl.-per-day capacity, the new unit is intended to serve as the focal point of an expansion and consolidation program of Texas Co. at Casper, which will make its Casper works (10,000-bbl. per day crude-charge rate) a model of small-refinery planning.

The cat cracker was designed and constructed by M. W. Kellogg Co., petroleum engineers of New York, who are also revamping and building catalytic polymerization, naphtha reforming, and pressure-coking facilities in the same refinery.

A new "balanced pressure" design is embodied in the unit. As a result, reactor and regenerator are supported at the same levels; an over-all reduction in height has been effected; and standpipe heights have been reduced. The reduced standpipe heights in turn enable a lower pressure drop to be maintained across the slide valves and so eliminate much of the erosion formerly found in these critical catalyst controlling mechanisms. Piping, too, has been simplified, with short direct runs to all major vessels and with only one expansion joint in the whole unit.

Oblong Arrangement

The plot plan, arranged in the shape of an elongated oblong, brings the reactor, regenerator, and precipitator into line in a main structure at the extremity of the battery limits. At the opposite face of the oblong, a second row of vessels brings the fractionator and gas recovery equipment into line. This oblong arrangement, open on all four sides with all big vessels on the outside, enabled each vessel to be lifted into position as soon as it arrived on the job site without interfering with other erection proceeding simultaneously. The installation of piping, structural steel, and internal auxiliary vessels was not delayed by this outside arrangement of the big vessels, nor did each large vessel in position interfere with the installation of its neighbor. As a result, the unit is a model of construction efficiency and clearly shows the effect of plot plan and vessel arrangement on construction costs, construction time and ease of maintenance.

Some highlights of the new design are:

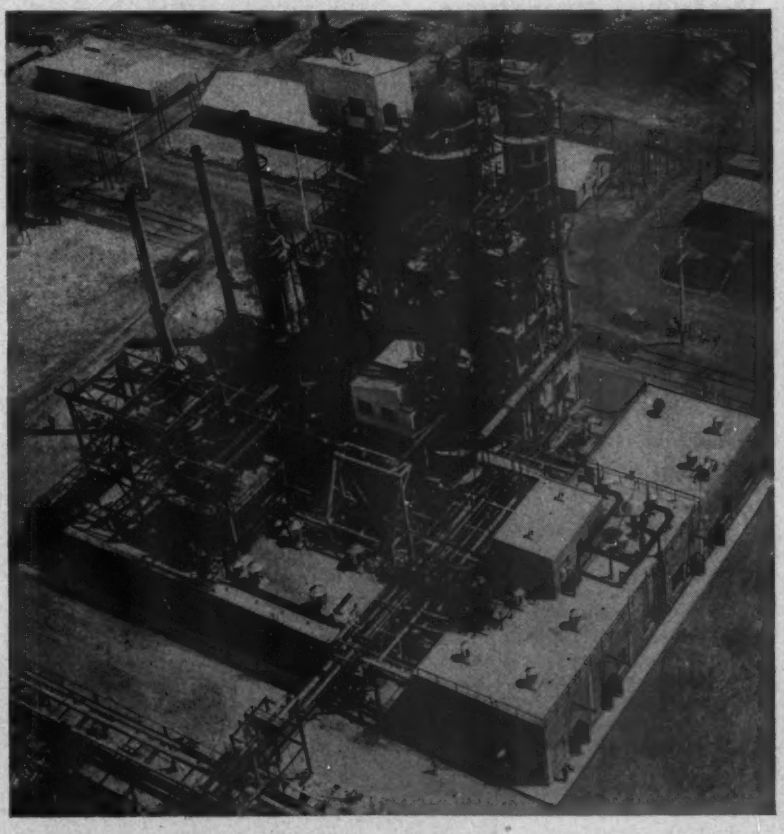
1. A new cylindrical electrical precipitator designed to operate at high pressure replaces the former box type. Additionally, it saves one-third of the investment cost of former designs through greater ease of fabrication on a leak-free basis and through reduction of reinforcing required.

2. Consolidation of the fractionator into a trifunctional vessel with a rectifying section, desuperheater and slurry settler all included in one tower has also reduced initial costs and improved the safety of the unit by eliminating danger of flash.

3. An outside stripper, separate from the reactor, more efficiently disengages oil from catalyst and returns the oil vapors to the top of the reactor. Preventing oil from entering the regenerator with the spent catalyst reduces the size of the regenerator and the air blowing equipment required.

4. All of the major vessels, except the regenerator, were shop fabricated with generous alloy provision for corrosion due to the high sulfur content of the gas oil processed.

5. All pumps, compressors, and blowers are steam driven for reliability and ease of control. The unit itself generates the majority of steam required for this purpose by recovery of heat from the flue gases and from the hot slurry which has been circulated to desuperheat the reactor vapor.



The new Fluid catalytic cracking unit at the Casper, Wyo., refinery of The Texas Co., designed and constructed by M. W. Kellogg Co. Performance is being watched with interest since it embodies a new design with a number of improvements for lowering initial investment and operating cost to a level attractive to operators of refineries with a crude-oil-processing capacity in the neighborhood of 10,000 bbl. per day

PERSONALS

Heads Middle East Producing Operations

GEORGE HESELDIN, deputy general manager of Iraq Petroleum Co., Ltd., with headquarters in Tripoli, Lebanon, is now visiting friends in the United States. Twenty years ago he was employed in Seminole field by Amerada Petroleum Corp.

Before entering a career in the petroleum industry Heseldin was graduated with a degree of master of science in civil engineering from the University of Leeds in England, where he was born. Following graduation he was employed as an engineer for a time by the petroleum branch of the Cowdray interests in Algeria and India. He came to the United States to obtain field experience when he decided to become affiliated permanently with the petroleum industry.

Since 1929 he has been employed continuously in field work by Iraq Petroleum and associated companies, and the Iraq company's predecessor, Turkish Petroleum Co. He was production superintendent of Kirkuk field in northern Iraq during the period in which that field became one of the largest single oil reserves in the entire world. He was employed as eastern division engineer during the construction of a pipe line, completed in 1934, from Kirkuk to Tripoli, and Haifa, Palestine, which furnished the first outlet for Kirkuk field. From 1937 to 1942 he was employed as field manager of British Oil Development Co., Ltd., owned by the Iraq company interests.

In 1942 he was transferred to Haifa, Palestine, and in 1943 became assistant general manager of the Iraq company in the Near East. In the spring of this year, Heseldin was promoted to deputy general manager (production). For the past 2 years he has been occupied in starting up exploration work in the Masul and Basrah areas in Iraq and in Syria, Lebanon, Palestine, Trucial Coast and Cyprus, where associated companies have large concessions. He has also spent considerable time in Qatar in the Persian Gulf where plans are under way to put Dukhan field in production.

Harold J. Lewis, assistant manager of the lubricating-oil department at the Houston refinery of Shell Oil Co., Inc., has been promoted to manager.

Raymond Gutschick, geologist with Gulf Oil Corp., has resigned. He will become assistant professor of geology at Notre Dame September 1.

M. G. Gamble, general manager of the marine department, Standard Oil Co. of New Jersey, has been elected an alternate member of the board of directors of the National Federation of American Shipping.

H. S. Gibson, general field manager of Anglo-Iranian Oil Co., Ltd., Abadan, has been awarded the Redwood Medal by the Institute of Petroleum, London, for his technological work in petroleum production. The medal will be presented at the Institute's meeting September 26, at which Gibson will speak on "The Production of Oil from the Fields of Southwest Iran." The presentation will be the eighth award of the medal, established in 1921, which is given to "a petroleum technologist of outstanding eminence, irrespective of nationality or membership in the institute." Gibson joined Anglo-Persian Oil Co., Ltd., as a production engineer in 1922, was promoted to production superintendent in 1928 and to production manager in 1930. In 1932 he became assistant field manager, in 1944 assistant general field manager, and in 1945 was made general field manager. Earlier this year he was awarded the C.B.E.

Roy W. Shave, roustabout for Stanolind Oil & Gas Co. at Brownfield, Tex., has been promoted to junior petroleum engineer and transferred to Odessa, Tex. **Bruce W. Reynolds,** roustabout at Odessa, has been promoted to junior petroleum engineer and transferred to Greggton, Tex. **Howell M. Hamilton,** petroleum engineer at Odessa, has been made head roustabout.

Bill Smith, assistant land man for Phillips Petroleum Co. at Craig, Colo., has resigned to accept a position as land man with Husky Refining Co. at Cody, Wyo.

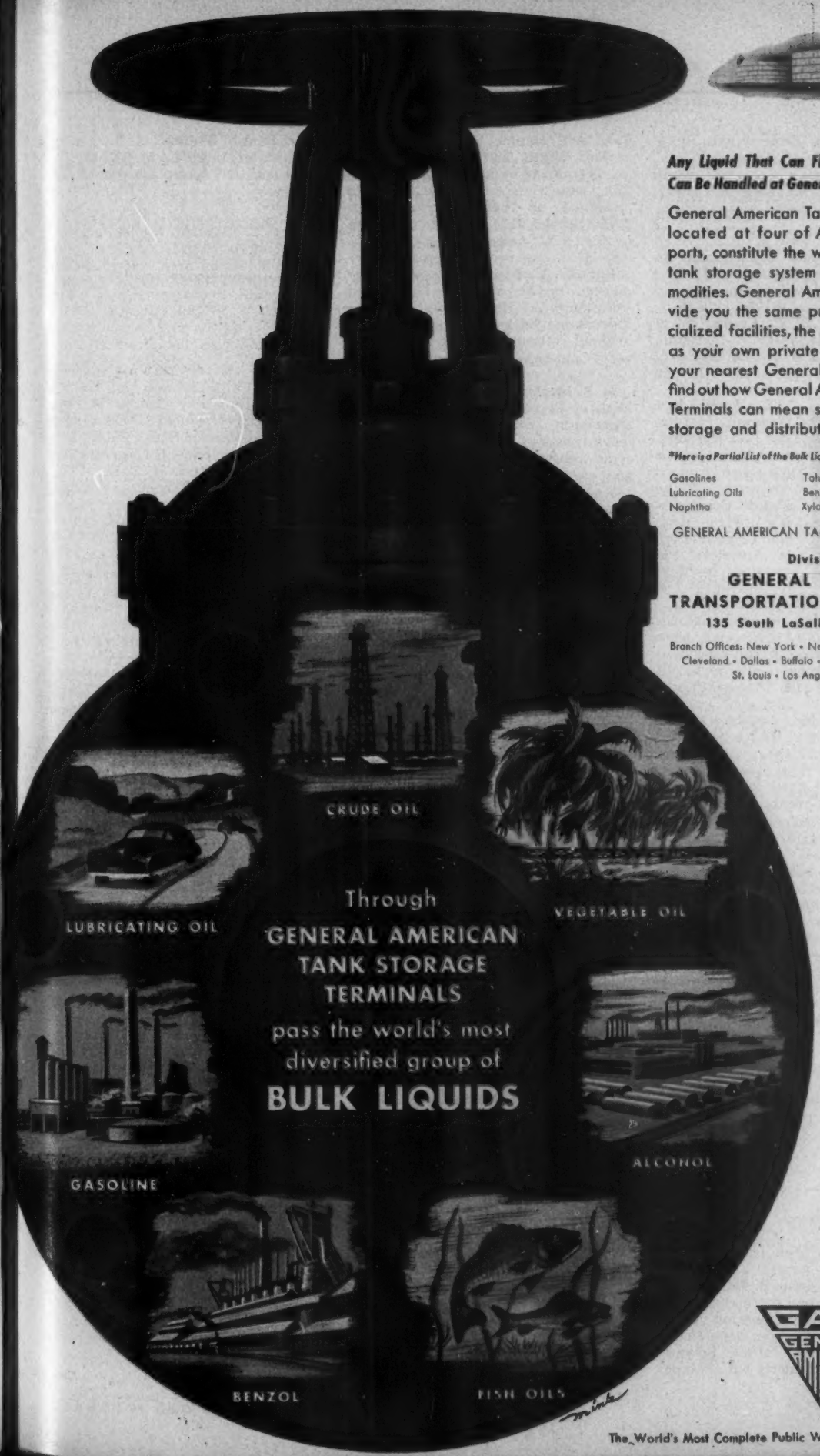
T. A. Boyd has been elected president of the American Society for Testing Materials. He assisted the late Thomas Midgley, Jr., in the search that led to the discovery of antiknock properties of tetraethyl lead.

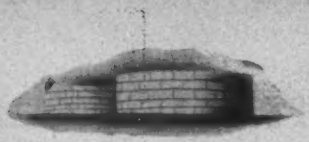
Michael C. Wilson, driller for Sinclair Prairie Oil Co., is preparing to leave for Ethiopia where the first wildcat in one of the wildest regions is to be drilled.

Cyril T. R. Wilson, of Moncton, has been appointed general manager of New Brunswick Oilfields, Ltd. He is the only remaining member of the administrative staff of the former owners of the oil and gas-producing company, having been the former assistant manager. Wilson obtained his engineering degree from Nova Scotia Technical College.

Dr. C. R. Wagner, consultant and authority on petroleum and organic chemistry, has been elected vice president of General Aniline & Film Corp. in charge of research and development. Wagner was made a member of the board of directors and the executive committee in April. He will coordinate and direct the company's research and development activities in resins, detergents, ozalid sensitized materials, photography and dyestuffs, and also a wide program of fundamental research in related fields. He was director of research and chairman of the manufacturing committee of Pure Oil Co. for several years. During the war he served with the Petroleum Administration for War, and since has served as consultant in the petroleum and organic chemical fields.

William John McPherson, Saskatoon, Sask., was awarded one of the four $1,000 fellowships given by Imperial Oil, Ltd. His fellowship will be for research in petroleum engineering. The other fellowships awarded include: **Thomas Parks,** Thamesford, Ont., research in petroleum geology; **James Duncan McGilvery,** Hamilton, Ont., and Sarnia, Ont., research in chemistry; and **Goeffrey Vernon Parkinson,** Vancouver, B. C., for research in mechanical engineering.





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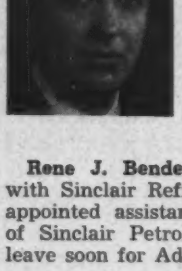
PERSONALS

Max Roberson, formerly with Simpson-Fell Oil Co. at Ardmore, Okla., will move to Denver, Colo., this month to join Fred M. Manning, Inc., drilling contractors.

W. S. Henry, land agent for Shell Oil Co., Inc., has been placed in charge of the new district land office at Denver, Colo., which was recently opened. His place in Tulsa will be taken over by **R. C. Erwin,** North Texas division land agent at Wichita Falls, Tex. **James A. Rehler,** formerly of Centralia, Ill., will succeed Erwin.



E. V. Watts, General Petroleum Co. production engineer, has been elected chairman of the Pacific Coast district of the division of production of American Petroleum Institute for 1947-48.

Rene J. Bender, former engineer with Sinclair Refining Co., has been appointed assistant to the president of Sinclair Petroleum Co. and will leave soon for Addis Ababa, Ethiopa.

Alan G. Skelton, member of the staff of the Kansas-Oklahoma division of the Mid-Continent Oil and Gas Association, has resigned effective September 1 to become head librarian in the technical library of the Waterways Experiment Station research center in Vicksburg, Miss.

E. R. Love, formerly with Tide Water Associated Oil Co., and later general superintendent of Camay Drilling Co., has been elected vice president and general manager of Camay.

D. E. Every, engineer, and **J. J. McCullough,** geologist, have been transferred from Union Oil Co.'s Madison, Kans., office to Cut Bank, Mont.

H. E. Rankin, division geologist at Oklahoma City for Shell Oil Co., Inc., has been transferred to Midland, Tex. He will be replaced by **John E. Owens,** division geologist at Wichita Falls, Tex., who will be replaced by **James Wilson,** Houston.

John C. McCarthy, petroleum engineer for Stanolind Oil & Gas Co., Fort Worth, has been transferred to the company's general offices in Tulsa, replacing **John B. Rosen,** who was promoted from petroleum engineer to petroleum engineering supervisor in the production department of the Tulsa general office. **Edward H. Vlackaller,** formerly of Pampa, Tex., will assume McCarthy's duties at Fort Worth. **Alton J. Carroll,** junior petroleum engineer at Greggton, Tex., was transferred to Pampa and promoted to petroleum engineer. **C. D. Brooks,** Odessa, Tex,. has been promoted to junior mud engineer.

Robert A. Powers has been appointed traffic manager for United Petroleum Co. He will be located at the company's headquarters in Minneapolis, Minn. Powers was formerly with Continental Oil Co.

A. P. Mechin, assistant to the president of Polymer Corp., rubber manufacturing company at Sarnia, is leaving early in September to become assistant to the general manager of refineries for Imperial Oil, Ltd., in Toronto. Mechin was with Imperial prior to the building of the synthetic rubber plant in 1942.

Carlos Vasquez Gomez, petroleum engineer formerly with Shell Petroleum Co. of Colombia, assigned to the El Dificil fields, will return early in September to Bogota, Colombia, where he has opened offices as a consulting engineer and a water-well drilling contractor. He is now on a business trip through the United States.

C. F. Stephenson, Magnolia Petroleum Co., has been transferred to Wewoka, Okla., as district superintendent. **J. E. Stanley** has replaced Stephenson as assistant district superintendent of the Alice, Tex., district, and **Herschel V. Harden** has replaced Stanley as assistant district superintendent at Lake Charles, La. **Walter M. Pittman** has been transferred to the Rodessa district as production superintendent.

The North Texas-New Mexico division of Stanolind Oil & Gas Co., Fort Worth, has employed a number of graduate engineers in its various districts. Included in the new group, their school and new work stations are: **John F. Kerr,** University of Tulsa, junior petroleum engineer at Greggton, Tex.; **Henry W. Hinkle, Jr.,** Oklahoma A. & M. College, junior petroleum engineer, Greggton; **J. F. Zellner,** Texas Technological College, junior petroleum engineer, Odessa, Tex.; **C. V. Helm,** Thayer School of Engineering, junior petroleum engineer, Andrews, Tex.; **W. C. Wunnicke,** Missouri School of Mines, junior petroleum engineer, Odessa; **L. E. Willsey,** University of California, junior petroleum engineer, Brownfield, Tex.; **B. J. Rhoads, Jr.,** Missouri School of Mines, junior petroleum engineer, Hobbs, N. M.; and **W. G. Johnston,** Alabama Polytechnic Institute, junior petroleum engineer, Odessa.

Dr. John T. Sanford, on the geological staff of Magnolia Petroleum Co., has joined the faculty of Wayne University.

Oren C. Baptist, former engineer with General Petroleum Corp. in the Rocky Mountain area, has joined the U. S. Bureau of Mines at Laramie, Wyo.

Shifts

William S. Herdan, engineer, Southern California Gas Co., Los Angeles to Burbank; **George M. Dorwart,** engineer, Union Oil Co. of California, Pasadena to Santa Paula; **D. E. White,** superintendent, Magnolia Pipe Line Co., Garland to Dallas, Tex.; **H. E. Prokesh,** geologist, Continental Oil Co., Henrietta to Fort Worth; **H. K. Herr,** foreman, Kerr-McGee Oil Industries, Inc., Colorado City, Tex., to Ardmore, Okla.

L. W. Storm, geologist, Sun Oil Co., Dallas to Denver, Colo.; **Jack T. Duree,** engineer, Magnolia Petroleum Co., Kermit to Midland, Tex.; **Richard D. Holt,** geologist, Humble Oil & Refining Co., Midland, Tex., to Roswell, N. M.; **Dan G. Hughes,** foreman, United Gas Pipe Line Co., Palestine to Dallas, Tex; **L. Decker Dawson,** foreman, Republic Exploration Co., Plainview to Hereford, Tex.

T. P. Drew, superintendent, The Texas Co., Sundown to Pampa, Tex.; **E. C. Swenson,** superintendent, Nicklos Drilling Co., Eunice, La., to Anahuac, Tex.; **John B. Ross,** engineer, The Texas Co., Baton Rouge to Houma, La.; **W. D. Carleton,** superintendent, Fohs Oil Co., Lake Charles, La., to Mont Belvieu, Tex.; **W. H. Lobaugh,** superintendent, Jasper Oil Co., Heidelberg, Miss., to Longview, Tex.

Elmer W. Peterman, engineer, Cities Service Oil Co., Russell, Kans., to Oklahoma City; **C. A. Houston,** engineer, Stanolind Oil & Gas Co., Zenith, Kans., to Jackson, Miss.; **H. P. Creel,** superintendent, The Texas Co., Casper, Wyo., to Westville, N. J.; **Irwin B. Allen,** engineer, Stanolind Oil & Gas Co., Midwest, Wyo., to Rangely, Colo.; **John V. Early,** superintendent, Anderson-Prichard Refining Corp., Cyril to Oklahoma City.

J. N. Conley, geologist, Seaboard Oil Co. of Delaware, Ardmore, Okla., to Abilene, Tex.; **J. O. Motsenbocker,** engineer, Phillips Petroleum Co., Bartlesville, Okla., to Kansas City, Mo.; **S. R. Cross,** geologist, Continental Oil Co., Sulphur, to Ponca City, Okla.; **L. G. Pope,** geologist, Carter Oil Co., Tulsa to Mattoon, Ill; **Winford M. Jones,** engineer, Stanolind Oil & Gas Co., Tulsa to Tampa, Fla.; **Sidney B. Richards,** engineer, Stanolind Oil & Gas Co., Tulsa to Casper, Wyo.

11 Independents Form Company to Engage in Foreign Operations

AMERICAN INDEPENDENT OIL CO., a $100,000,000 corporation created to engage in foreign petroleum operations, particularly in the Middle East, was formed Monday at a meeting in Bartlesville, Okla.

The incorporators are 11 independents with combined assets in excess of a billion dollars.

Creation of American Independent marks the first time that a large-scale, substantially financed program has been undertaken by independents in foreign oil operations, heretofore carried on almost exclusively by Standard, Gulf and Royal Dutch-Shell interests.

President of American Independent Oil Co. is Ralph K. Davies, wartime deputy petroleum administrator and former senior vice president of Standard Oil Co. of California. Other officers include K. S. Adams, Sam B. Mosher, and J. Howard Marshall as vice presidents.

The incorporators are J. S. Abercrombie, Allied Oil Co., Ashland Oil & Refining Co., Ralph K. Davies, Globe Oil & Refining Co., Hancock Oil Co., Honolulu Oil Corp., Los Nietos Co., Phillips Petroleum Co., Signal Oil & Gas Co., and Sunray Oil Corp.

Directors Elected

Directors, elected Tuesday, are K. S. Adams, Vernon Barrett, Jack Blalock, L. A. Cranson, Ralph K. Davies, Don Emery, Paul Endacott, Russell H. Green, John W. Hancock, J. Howard Marshall, A. C. Mattei, San B. Mosher, I. A. O'Shaughnessy, Frank Phillips, Will J. Reid, W. W. Vandeveer, and C. H. Wright.

Offices of the company, incorporated in Delaware, will be in Washington and San Francisco.

Concerning its program, Davies said:

"Everyone recognizes that the security and well-being of the United States depend upon ample and continuing supplies of petroleum products. Everyone recognizes, also, that there can be no assurance that all of these necessary supplies can be derived wholly from domestic sources.

"At this very moment, petroleum products are in short supply in the United States and have been for months.

"Whether this is a temporary situation, which will be overcome when steel and transportation become easier, is something that no one can know. But, what everyone does know is that the demand, both domestically and worldwide, has increased and will continue to increase.

"It is therefore obviously in the national interest that we have access to oil resources beyond our shores, so that we shall be able to supplement our domestic supplies whenever they cannot efficiently meet demands.

"To this task, the American Independent Oil Co. proposes to devote its efforts. In so doing, it recognizes that the launching of a large-scale, long-term foreign oil program is something of a precedent for independent operators.

"Nevertheless, we believe that the interest of the American consumer will be best served by the active, substantial and permanent participation of American independent oil operators in the international field. Certainly all will agree that the consumer is in a more favorable position when there is competition by the many, rather than control by the few, however well-intentioned and beneficient.

"We believe that the major concession-holders will, themselves, benefit, particularly from the standpoint of their relationships with the public and the Government, by the introduction of wholesome rivalry into areas where control is now concentrated.

"The American Independent Oil Co. intends to devote its energies to strengthening the American position abroad, and to do so in the American tradition of free, competitive enterprise, always mindful that, in dealing with an indispensable natural resource, its first duty is to serve the national interest."

DEATHS

David B. McCalmont, 70, independent oil producer, died August 12 in Franklin, Pa.

J. W. Woodward, manager of Esso Transportation Co., Ltd., died recently at Aruba. He spent 27 years in the Marine Department of Lago Oil & Transport Co., of which he was a director. During World War II he served as manager of tanker operations at the Panama Canal. Prior to this service he was in charge of port operations at the Bayonne, N. J., docks of Standard Oil Co. (N. J.).

Patrick H. Mack, 95, oil man and inventor of oil-field equipment, died August 16 in Bradford, Pa. Mack, who retired in 1931, was given the title of "pioneer of pioneers" in the oil industry by the International Petroleum Exposition in Tulsa about 10 years ago.

Fred E. Melat, 87, retired district manager for Gulf Oil Corp., died August 10 in Wichita Falls, Tex.

M. H. Hughey, 68, oil operator and philanthropist, died August 12 at Charlotte, Tex.

J. Ivan Harris, 52, for many years vice president of the Indiana Independent Petroleum Association, died recently in Indianapolis, Ind.

William H. Sanders, 73, retired oil man and resident of Wichita Falls, Tex., died there August 12.

Pete Hensen, 65, independent oil operator of Ranger, Tex., died August 17 in Colorado while vacationing.

Ashley Manning Smith, 67, auditor for Gulf Oil Corp., died at his home in Houston August 14. He had been with the Gulf as an auditor for 26 years.

Investigation Ordered Into Detroit Shortage

The Department of Justice has ordered an investigation into the shortage of gasoline supplies in Detroit, Mich., where last week municipal officials threatened to seize all gasoline in the city to keep its necessary vehicles running.

Attorney General Tom Clark directed the anti-trust division to determine if any violations of federal laws are involved.

Detroit officials accused refiners of refusing to sell directly to the city. Standard Oil Co. (Ind.), the largest supplier in the Middle West, has announced that motorists' supplies in general were reasonably adequate.

Temporary relief was seen when Rankin Peck, president of the National Congress of Petroleum Retailers, notified city officials he had been given commitments for enough gasoline for street railways, fire, police, and sanitation services.

17 Veterans Purchase 422 WAA Tank Cars

Phillips Petroleum Co. will lease 136 of the 422 propane tank cars recently sold by War Assets Administration to 17 veterans. The largest single purchaser was Martin H. Champion, Oklahoma City, who will lease his 136 cars to Phillips.

Other probable users of tank cars and the number they will lease are: Warren Petroleum Co., 101; Union Tank Car Co., 84; Skelly Oil Co., 14; Cumberland Gas Co., 11; Westland Oil Co., 5; Prime Petroleum Products Co., 3. Four cars are not yet assigned to a lessee.

Gravity station on Ikpikpuk River. This is the first application of airborne gravity meter. From 10 to 20 readings are made daily

AIRBORNE, SURFACE, AND SUBSURFACE FACILITIES USED IN

Seeking Arctic Oil

by C. O. Willson

POINT BARROW, Alaska. — Those who are directing the exploratory program in Naval Petroleum Reserve No. 4 in this Arctic area are using most of the tools and methods known to the science and practical arts of finding new oil. Starting 3 years ago, the Navy, United States Geological Survey, consulting firms, and contractors in charge of operations, have used all the exploratory facilities which they thought would aid in expediting the search for oil in a 35,000-sq.-mile tract which was set aside in 1923 by President Harding as a Naval Petroleum Reserve.

This is the third and final article in a series by the author, based on data obtained during a first-hand inspection during a visit to the U. S. Naval Petroleum Reserve No. 4, last month. Other articles have appeared in the issues of August 9 and 16.

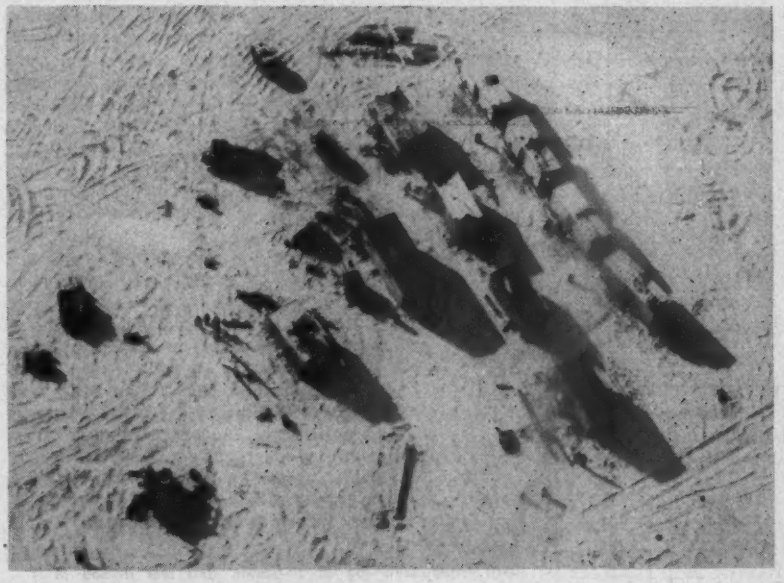
Geological and geophysical exploration work completed and under way in U. S. Naval Petroleum Reserve No. 4

The exploration techniques so far include aerial magnetometer and aerial photography covering the entire reserve, surface geology, gravity meter (ground and airborne), seismograph, complete laboratory facilities, core holes, one test hole completed, and two test holes drilling. From this activity, which is summarized in an accompanying map, has evolved a well-defined exploratory program the details of which have been changed from time to time to conform with the latest surface and subsurface information.

Future Policies

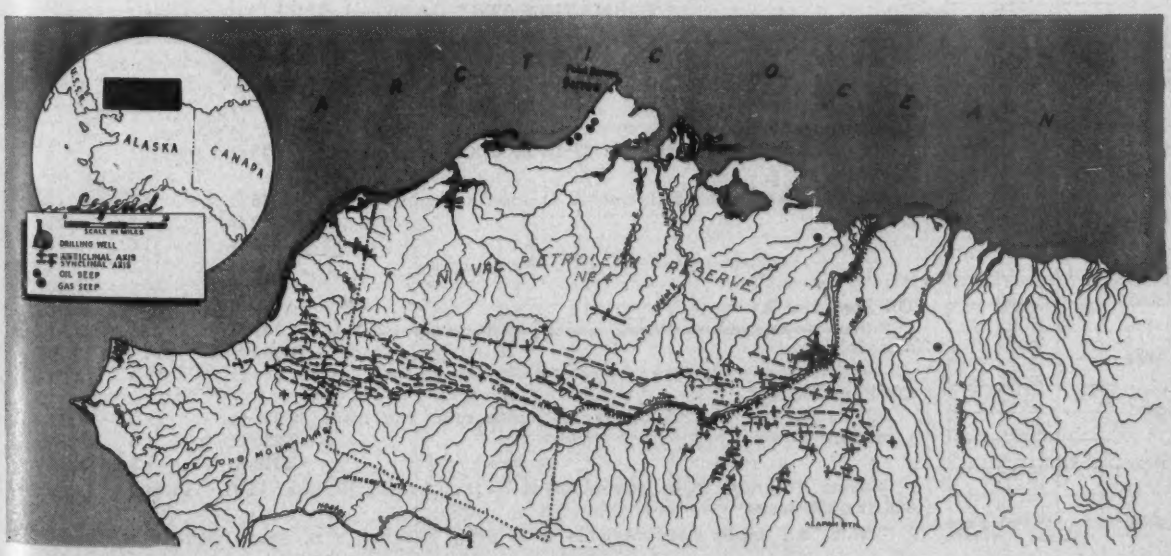
It is now apparent that two conditions will have a bearing on future exploration policies in the reserve. On a basis of present knowledge the boundaries of the existing reserve should be changed to include a sizable area to the east and south as shown on the map. If there are objections to increasing the size of the reserve the area to be added could be offset by excluding from the reserve the area lying southwest of a line running in a southeasterly direction from Point Franklyn to Lat. 68° 50′ north; Long. 156° west. The area would be extended on the south to Lat. 68° north and on the east to Long. 147° west.

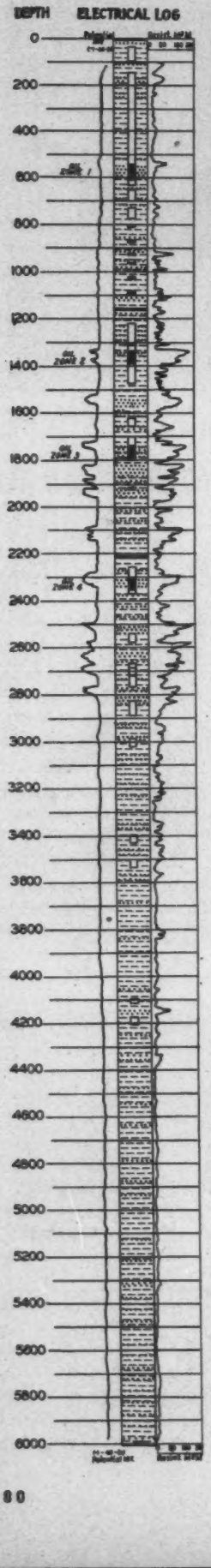
This proposal is not to be interpreted as condemning the southwestern section of the present reserve as a possible petroliferous area. It does reflect the fact that reconnaissance and detailed exploratory work indicate that structural and stratigraphic conditions east and south of the present reserve are similar to those found in the north and eastern part of the reserve where test drilling is now under way on well-defined structures and where it is hoped that commercial oil will be found without going



Above: Core testing is an important phase of exploratory work. Below: Seismograph headquarters established before arrival of summer season

Northern Alaska geological structures and oil and gas seeps at close of 1946





Left: Condensed log of 1 Umiat, first test drilled in Arctic Alaska

Wanigans en route to operating headquarters

to the expense of exploring and testing deep horizons. All of the Alaskan Arctic is public lands and was withdrawn from private exploration during the war and no change has been made since the war's end. The remainder of Alaska has been reopened for private development by the Department of the Interior.

It is also evident that a complete check of the oil possibilities of the reserve cannot be completed with the funds provided for that purpose and within the allocated time. The appropriation of $9,600,000 extends to July 1, 1950. Unless additional funds are provided it will be necessary to bring the exploratory operation to a close by the end of 1949. The time and funds after that date will be required to withdraw from the reserve. Regardless of the success or failure of the tests now drilling and that of two or three tests to be drilled next year the information on structural and stratigraphic conditions leaves no doubt that a more extensive and prolonged exploratory program will be necessary to determine whether or not the area has important oil reserves.

It is assumed that this situation will be brought to the attention of the Congress at its next session and some action taken before the 1948 field activities get under way. As was apparent from the previous articles on the reserve in this publication, the carrying on of exploration activities in Petroleum Reserve No. 4, due to location, terrain, climate, and transportation conditions, is costly and its oil potentialities cannot be determined with the present appropriation.

Geology

The geological literature reveals that the first reports indicating the presence of petroleum within that part of Northern Alaska which is now included in Petroleum Reserve No. 4 came from the U.S.G.S. in 1909 and had to do with an oil seepage at Cape

FORMATION TEST DATA — 1 UMIAT

Elevation,* ground level: 801 ft. Age: Upper Cretaceous, surface to 6,000 ft.

	Depth (approx.)	Permeability, md.	Porosity, per cent
Oil Zone No. 1:			
D.S.T., packer at 530 ft.; rec. 37 ft. mud and trace of oil.	535 ft.	1	5
Oil Zone No. 2:			
D.S.T., packer at 1,325 ft.; rec. 71 ft. mud and trace of oil.	1,340 ft.	1.2	17.7
	1,350 ft.	5.2	20.0
	1,360 ft.	1.0	13.9
	1,380 ft.	1.0	14.4
	1,385 ft.	7.4	12.9
Oil Zone No. 3:			
Bailed down and swabbed; no oil; fluid level 1,200 ft.	1,745 ft.	27.5	16.0
	1,750 ft.	14.9	18.3
	1,755 ft.	13.4	21.9
Oil Zone No. 4:			
D.S.T., packer at 2,252 ft.; rec. 5 joints, mud and trace of oil.	2,325 ft.	25.2	19.6
	2,330 ft.	1.0	14.3
	2,340 ft.	1.8	14.6

Casing Program: 24-in. conductor at 25 ft.; 14 sacks 16-in. at 95 ft.; 110 sacks 11¾-in. at 685 ft.; 350 sacks.

***Note: All depth measurements from kelly bushing, 9 ft. above surface of ground.**

Seismograph party starts work in late March

Simpson, near the location of a test now drilling. Seepages were later reported at other points by U.S.G.S. In 1917 an oil geologist visited the seepage at Cape Simpson and because of his report his company sent a party of geologists to the area in 1921.

A comprehensive geological program was started by U.S.G.S. in 1923, after the Naval Reserve had been established. Many of the reported oil seepages were investigated and it was determined that some of them showed no signs of petroleum. The U.S.G.S. investigations of the middle twenties outlined the general geology of northern Alaska, and the presence of the Upper Cretaceous with a thickness of 10,000 to 15,000 ft. as a possible oil province was reported. These and other investigations were published by the U.S.G.S. in Bulletin 815 on "Geology and Mineral Resources of Northwestern Alaska," in 1930. This report is the accepted geological reference work on northern Alaska previous to 1929.

These early investigators gave consideration to the geographic as well as the geological factors in the search for Arctic oil in Alaska. It was realized then that exploration work would require large expenditures and, should oil be found in substantial quantities, making it available for markets outside the reserve would present a major problem.

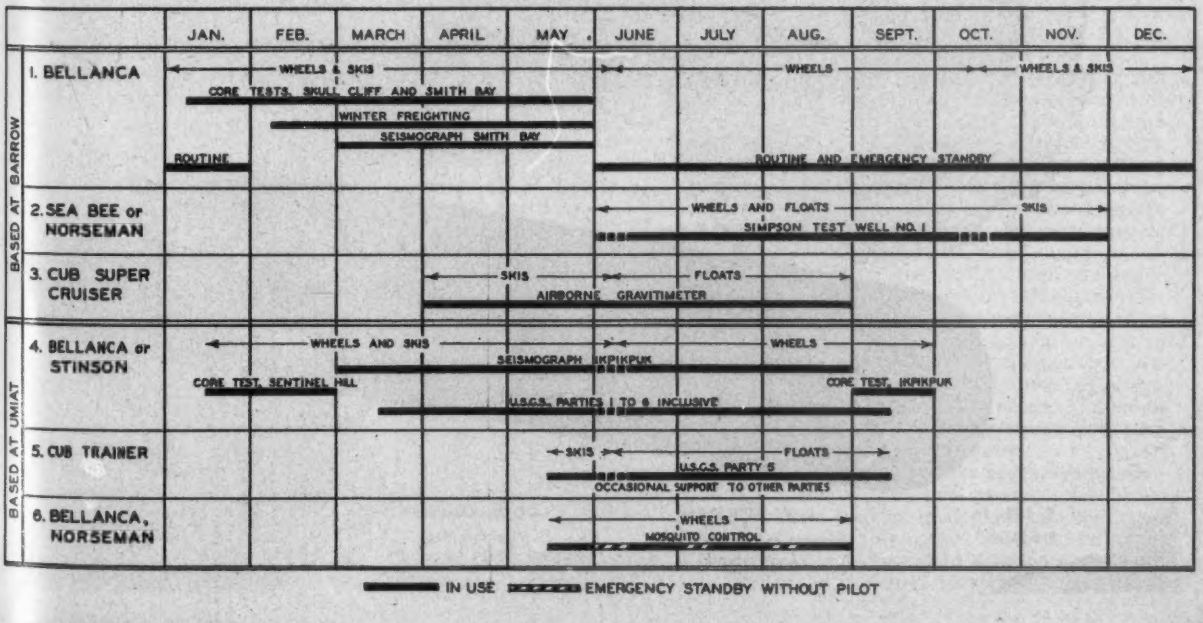
These geographic factors were investigated in 1943 when the first decision was made actively to seek oil in the reserve as a war measure. The entry of the United States in World War II had ended the isolation of central and northern Alaska and in a prolonged conflict it was felt that commercial oil in the reserve would be a substantial contribution to the Allied war program. The job was first turned over to the Seabees who had a large part of the program under way, including the partial drilling of the first test, at Umiat on V-J Day.

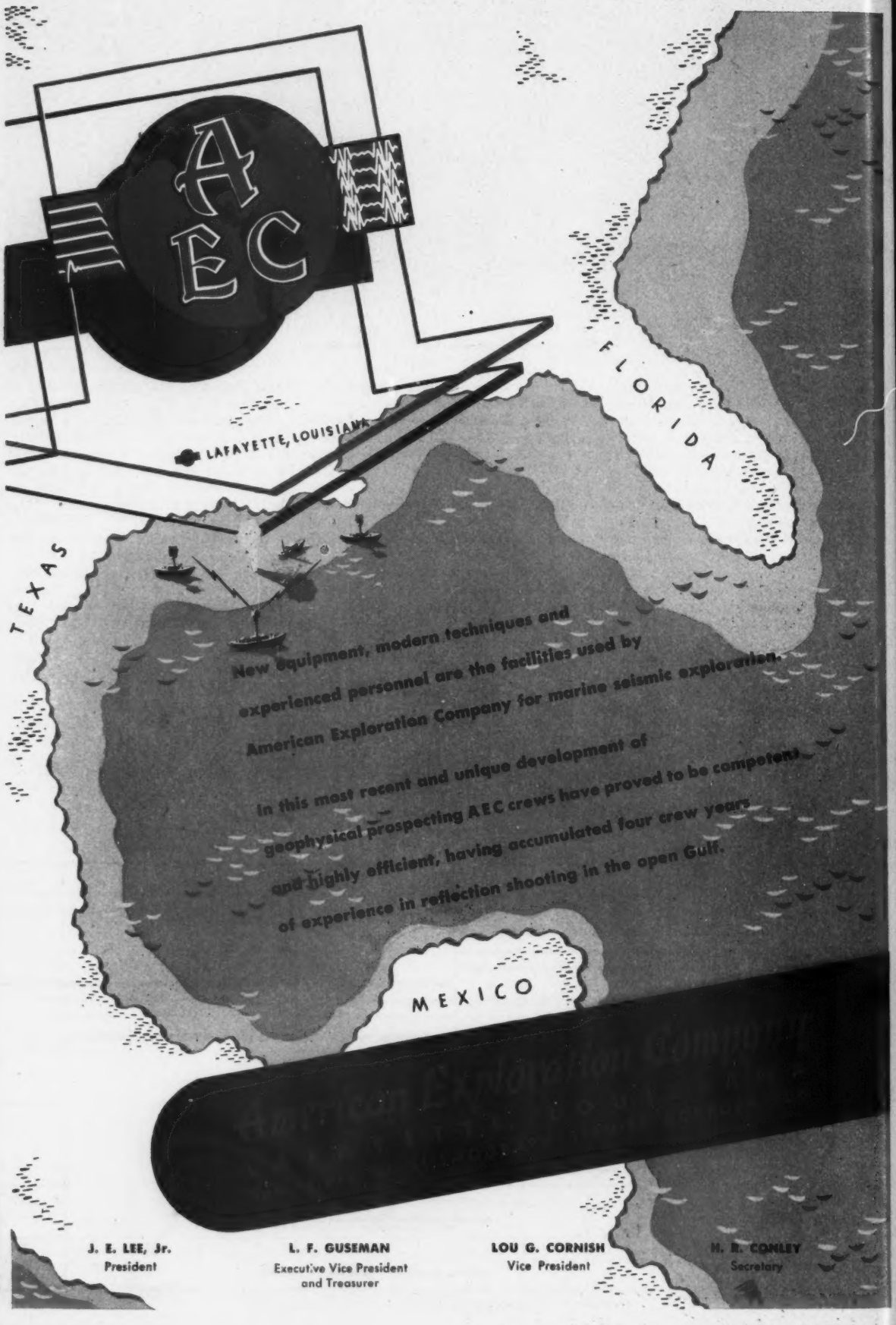
The postwar program is a recognition on the part of Congress and the Navy that the close of World War II did not end the need for oil in the Alaskan Arctic if it can be found in important quantities. It is agreed that the military importance of Arctic Alaska is steadily increasing, due largely to the fact that it is part of the northern crossroads connecting the Eastern and Western Hemispheres. It is also hoped that sufficient petroleum will be found in northern Alaska to represent a peacetime contribution to the indigenous supplies available for use in the United States.

When the Navy took over from the Seabees in late 1945, an organization to carry on the exploration was adopted as explained in previous articles of this series. The operation is di-

(Continued on page 125)

Bush flying schedule, supporting exploratory operations

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Instruments in PROCESS CONTROL

by E. D. Mattix*

APPLICATION of instruments in designing process-control systems should not be considered until the process has been analyzed thoroughly. What is to be accomplished in the process is of first-order importance to the experienced application engineer, generally, in normal design procedures. With these data, plus detailed information on the construction and layout of the process unit and its equipment, the designer can develop a control system which produces the desired results economically.

In general the average instrument engineer's training is proportionately insufficient in the fields of specific process design and operation and of instruments to allow him to solve all of the problems of instrument application in a given process without assistance from the process engineers and designers. A discussion with these engineers often reveals process peculiarities which appear unimportant when their effect on process is unknown and which if not considered in instrumentation could cause failure of the control system. In such discussions the designer of the control system should learn what, how and why about the process, as for example:

What:

1. —information is missing from the process flow diagram.

2. —minimum and maximum conditions can be expected in feed rate, composition, and product purity.

3. —will take place if correct operating conditions are not maintained.

4. —surge capacity in time is allowed in various vessels.

How:

1. —does the process work.

2. —will the process react to various changes, and is the reaction self-compensating or not.

3. —closely should the process be controlled.

Why:

1. —does the process react as stated.

2. —not have various minor changes made to improve controllability.

With all information and data as outlined in the foregoing available to the instrument application engineer, he may proceed to design a control system as indicated. A typical illustration of how a minimum number of instruments perform to give maximum results when control design is based on process analysis is that of a control system for a debutanizer, the flow diagram of which is shown in Fig. 1.

All information relative to controls for the debutanizer tower may be obtained from the engineer who made the process calculations for the vessel. As a rule this engineer determines all of the tower's physical dimensions except those pertaining to the strength of its structural parts. He can inform of the expected conditions of temperature and of pressure in the various points in the tower from which information the application engineer ascertains the use of temperature controller and where its thermo-well shall be located. Frequently one finds a tower that does not require a temperature controller for one of two reasons:

1. Temperature control is not indicative of desired results.

2. The tower is a "freak" having temperature control as a designed-in function.

From an instrumentation viewpoint the debutanizer unit is composed of a tower, reboiler, condenser, reflux drum, and reflux pump as the primary items of equipment. The secondary items are piping and various accessory items of equipment such as a feed preheater and, when required, the pump for delivering feed under sufficient pressure to force it into the tower.

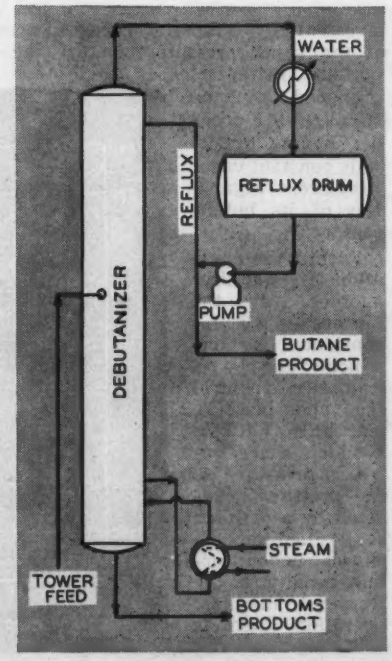


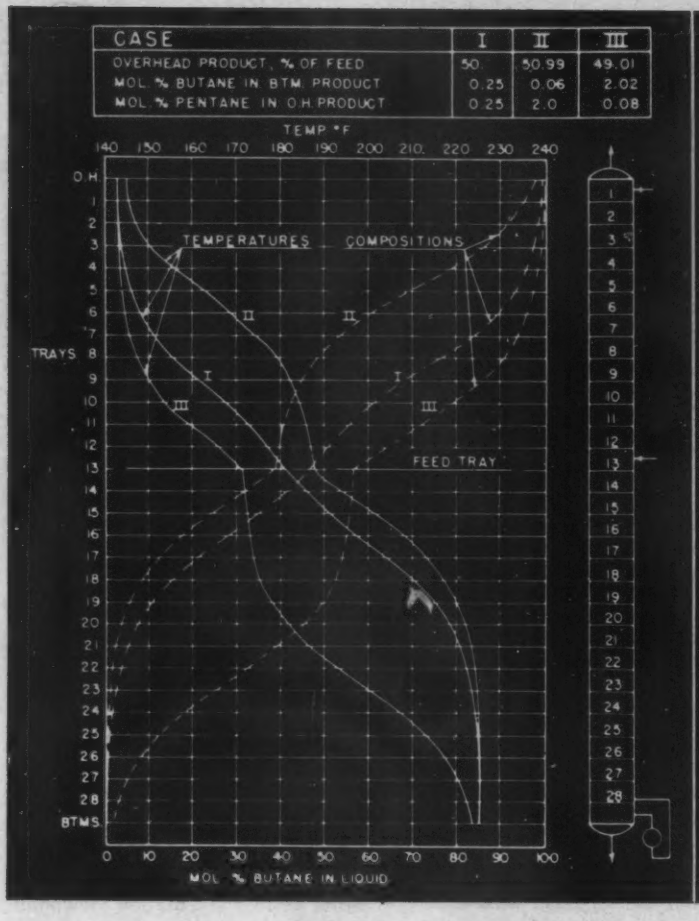
Fig. 1—Flow diagram of a debutanizer system

Proportions of Tower

Normally a debutanizer tower has on the order of 30 plates and will operate with a top plate minimum pressure proportionate to the ability of the condenser to condense reflux with the available cooling medium. However, this minimum pressure must not be above that necessary to allow the bottom-plate liquid to vaporize in the reboiler with the available heating medium. The tower diameter is determined by the feed rate, reflux rate, normal operating pressure, and feed composition. Its height is set by the number of plates. Feed rate and composition, number of plates, and desired product purity determine reflux rates.

The tower plates are classified commonly into two groups, one above the feed or inlet plate and the other below this point. Those in the upper group are called fractionating plates and function to separate the heavy

*Cities Service Refining Corp., Lake Charles, La., technical assistant, instruments, with assistance of G. S. Houghland.



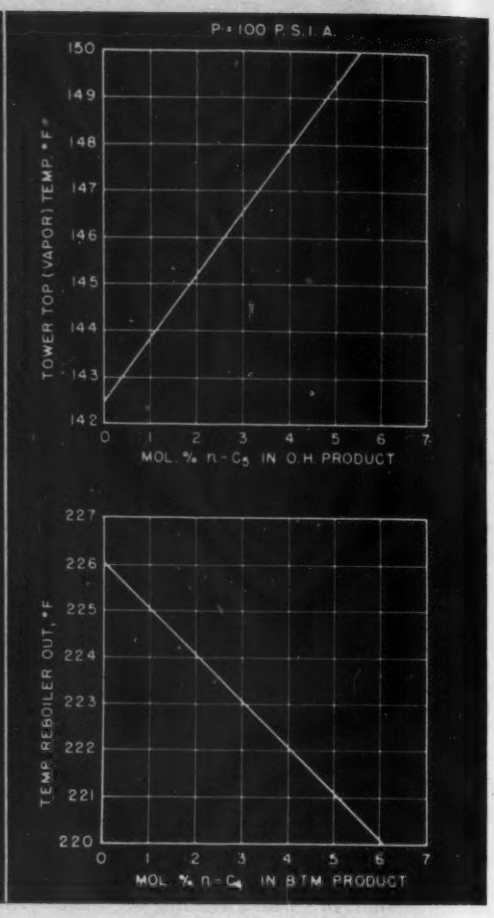


Fig. 2—(Left) Debutanizer tray temperature and composition, showing values above and below feed tray. Fig. 3—(Right) Effect of temperature on product composition on debutanizer tower top and bottoms

ends from the overhead product. The function of the lower group of plates is to strip or separate butane from the bottom product and consequently they are called stripping trays or plates. Location of the point of feed in the tower is determined by the composition of the feed and by the desired purity of the overhead and bottom products.

Reflux condenser size is determined by the overhead composition and rate, reflux rate, tower pressure, and temperature of the cooling medium. Temperature and composition of feed, tower pressure, and temperature of the heating medium all govern reboiler size. When superheated steam is employed to heat a reboiler the temperature used is that of the steam condensing point.

The purpose of a debutanizer is to separate butanes and pentanes. Even when the bottoms product contains heavier components the separation of butanes from the feed is the specific function of a debutanizer. The principal difference between a stabilizer and a debutanizer operation is in the point at which the feed components are separated. A debutanizer operates to produce a bottom product which is essentially butane free regardless of the vapor pressure, whereas the bottoms material produced by the stabilizer is a product having practically constant vapor pressure, regardless of its butane content.

Putting the operation of a stabilizer another way, the process may be considered as one which functions primarily to control the vapor pressure of the bottoms product. Since vapor pressure is the pressure generated by a gasoline at specified temperatures under certain conditions, the desired stabilizer operation then is that of constant bottom temperature and pressure conditions. When this condition is maintained changes in feed composition, ranging all the way

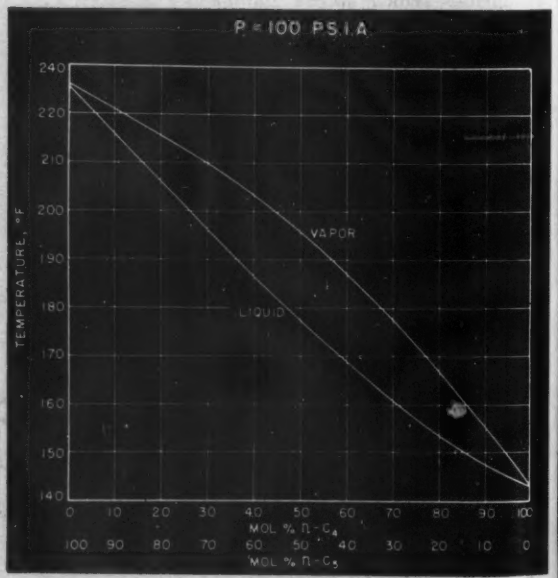


Fig. 4—Temperature-composition diagram for n-butane—n-pentane system

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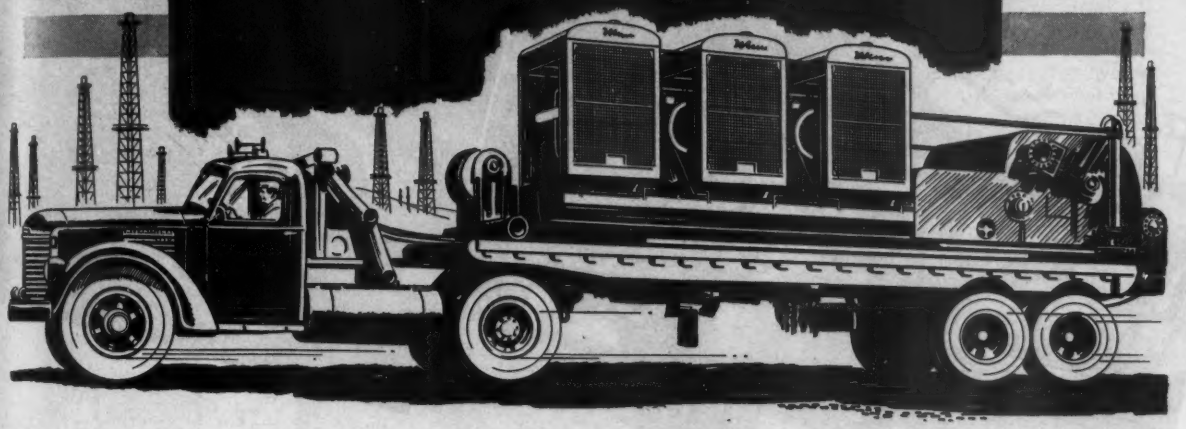

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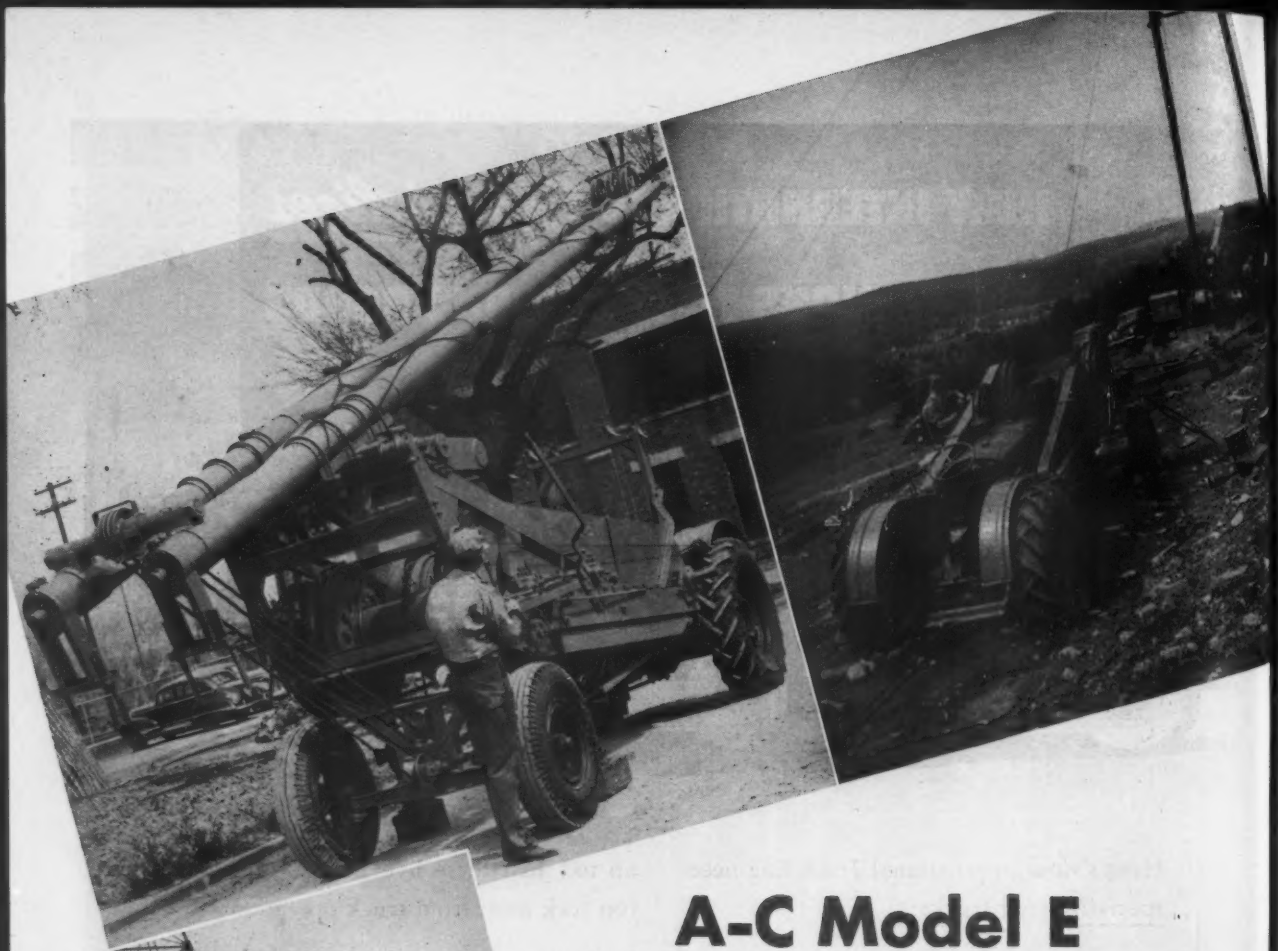

Counter Clockwise: Model E Double Drum Winch Tractor. Model E Double Drum Winch Tractor with 2 pole telescoping mast and spudding equipment. Model E Double Drum Tractor-Spudder. Maximum Line Pull of Model E Units is 54,700 lbs. Maximum Line Speed is 1,074' p.m.

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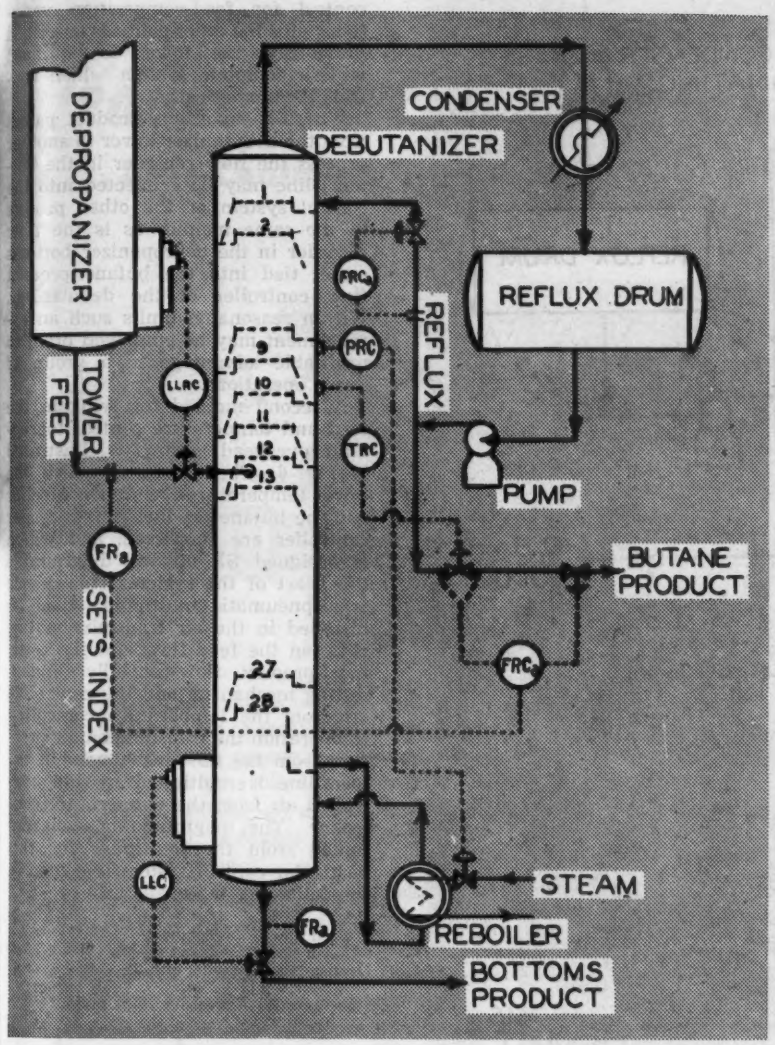

Fig. 5—Flow diagram of a control method for a debutanizer

from various percentages of butane to those of pentanes and heavier, have little effect on bottoms-product vapor pressure although its composition will vary according to that of the feed. For this reason every effort should be made to hold the stabilizer reboiler at constant temperature.

Records of reboiler temperatures can be misleading in debutanizer operation and consequently the recording type of instrument normally used at this point can be replaced with a nonrecording type at some saving in instrumentation cost. Operating results usually improve thereby and particularly in those cases where operators are familiar with stabilizer operation and relatively constant temperature charts are expected from reboiler operations.

The two groups of curves shown in Fig. 2 indicate liquid composition and temperatures for each tray under three different conditions of overhead rates when feed quality and rate are held constant. In these particular cases the feed to the debutanizer tower is 50 per cent n-butane and 50 per cent n-pentane. Curve I shows what happens when the tower is operating under desired conditions where 0.25 per cent pentane is in the overhead. Tray temperature and composition change little for the first several trays, but as the feed tray is approached the changes become much greater above or below the feed point.

Curve II shows tray-to-tray differences in temperature and composition when the butane product contains 2 per cent pentane. Neither of these curves shifts appreciably at its ends but in the center portion of the tower the shift is large. Curve III shows what takes place throughout the tower when the bottoms product contains 2 per cent butane. The top temperature indicated by Curve III shows no change from that of Curve I and their difference at the bottom is only 2° F. but at the tower's center the curve has shifted sharply. The distance between these two curves shows temperature and composition changes that may be expected when the overhead and bottom products compositions are changed respectively to include 2 per cent pentane or 2 per cent butane.

A study of the curves shows that neither the top of the tower nor the reboiler outlet is a suitable temperature control point if the debutanizer is operated at constant pressure. Although either of these two locations are often erroneously used as a control point, other locations where the temperature difference between Curves II and III is greater will show much better results. For this particular tower, tray 9 is indicated to be the better location for the control point because the spread between Curves II and III and from Curves II and III to I at this point is at maximum. When compared with the top or bottom tray, the ninth tray provides nearly 10 to 1 advantage. Figs. 3 and 3-A show how closely the tower top or reboiler temperature would have to be controlled to effect a good separation in the debutanizer. The temperature composition diagram (Fig. 4) can be used to find the liquid and vapor composition on various trays of the tower.

Debutanizer Hookup

The next factor to be considered in the design of a control system for the debutanizer hookup shown in Fig. 1 is that of its source of feed. If the feed comes from storage, the rate and composition are usually constant, and the instrument application problem normally is less complicated than if the feed comes direct from another process. A control method for a debutanizer which receives its feed from a depropanizer is shown in Fig. 5. In this case the depropanizer receives its feed from a deheptanizer which in turn is supplied with feed material from several units. Consequently, feed rate and composition to the debutanizer vary over a wide range. With the instrument hookup shown in Fig. 5, the debutanizer operates to produce the desired product quality under full automatic control, regardless of changes in feed.

Pressure in the tower is maintained by controlling the heat to the reboiler. The valve in the steam inlet to the reboiler has a positioner which provides close control and the pressure top for the instrument is connected into the same tray into which the temperature controller thermocouple is located.

Tower feed is controlled with an averaging-type liquid-level controller; its control valve is provided with a positioner; and there is about 15 minutes' holding time in the base of the depropanizer. A flow controller in the reflux stream, the tower bottoms regulated with a throttling-type level control and a flow instrument record-

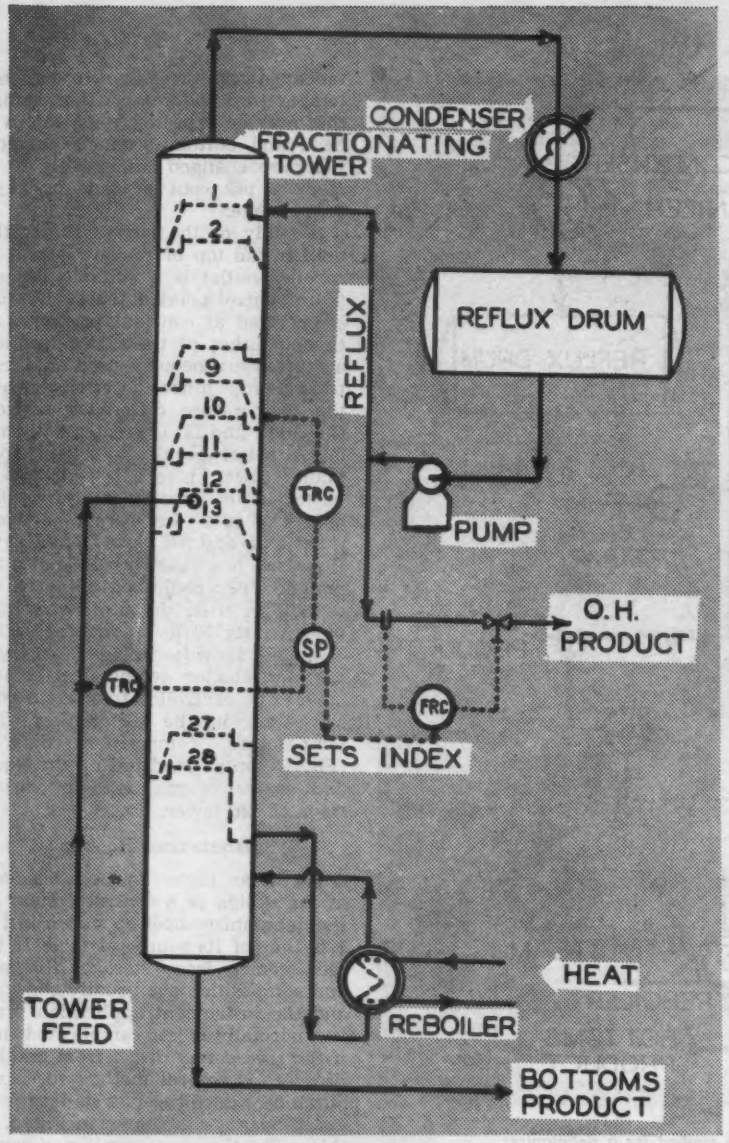

Fig. 6—Arrangement for controlling fractionator column with proportioning ratio system

ing bottoms production are provided in usual automatic control system for a normal debutanizer. Since the feed rate is variable the product will be variable also at the same time and in direction, if not to the same degree. Consequently the butane product volume should be controlled relatively to that of the feed in order to maintain constant product quality. Such control is obtained by allowing the feed flow recorder to set the index of the butane product flow controller. This arrangement insures proper changes in product rate whenever the feed rate is changed and with an improved effect on the controllability of the tower. The temperature controller functions to compensate for any changes in feed composition, without regard to volume, by controlling the flow of overhead product. This control is obtained by operating a variable orifice in the product line with the temperature instrument so that a temperature rise decreases the orifice size and butane product flow controller meter factor and a fall in temperature causes opposite action. Since the reflux drum is operated flooded level no controller is required for it.

No instruments are required to adjust the process for balancing against conditions wherein an increase in condenser surface is required since the needed condenser surface is made available because the increase in butane product at the instant of change comes from the reserve in the condenser. This demand on the reserve lowers the level in the condenser and thereby exposes additional surface for handling the increased vapor when it reaches the condenser.

In order to eliminate any variations due to pressure drop the pressure tap and thermocouple connection are made for their respective controllers at the same tray. With this last tie-in of these instruments to control for feed-composition variations, plus the other controls described previously, the tower is equipped with a complete system which controls it automatically.

Where the bottoms product passes from the debutanizer tower to another process the flow recorder in the bottoms line may be connected into the control system of the other process in the same manner as is the flow recorder in the depropanizer bottoms outlet tied into the butane product flow controller of the debutanizer. Within reasonable limits such an arrangement may be employed often to profitable advantage in a group of series operations.

A second method for tying in the feed and temperature control to regulate overhead product is illustrated in Fig. 6. The item into which the tower temperature-recorder controller and the butane product-flow-recorder controller are connected, and which is designed SP on the diagram, is the heart of the system. This device is a pneumatic multiplier which is installed in the air transmission line between the feed flow and the overhead-product flow-controller index-setting mechanism and the controlled air from the temperature controller. In operation the transmission air pressure from the flow instrument in the feed line is multiplied by the controlled air from the temperature controller. The magnitude of gain obtained from the multiplier for this particular control system is shown in the following table:

Feed flow recorder transmission air pressure/lb.	Temperature controller output air pressure/lb.	Relay output air pressure/lb.
2	2	2
8	2	5
14	2	8
2	8	2
8	8	8
14	8	14
2	14	2
8	14	11
14	14	*14

*Limited on output air pressure by maximum set on supply.

In other words, with 2-lb. controlled air pressure from the temperature controller the relay input to output ratio is 1:0.5, with 8-lb. the ratio is 1:1, and with 14-lb. the ratio is 1:1.5.

In operation any action by the temperature controller varies the multiplying factor in the relay which in turn changes the air pressure to the product - flow - controller index. Changes, either up or down, in product flow as demanded by the temperature instrument correct the temperature in the direction indicated because of the change in tray composition resulting from changes in product flow.

Either of the two control methods outlined above could be used with much improved results on many debutanizers in operation today.

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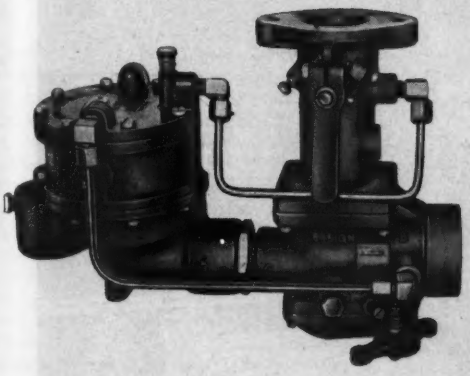

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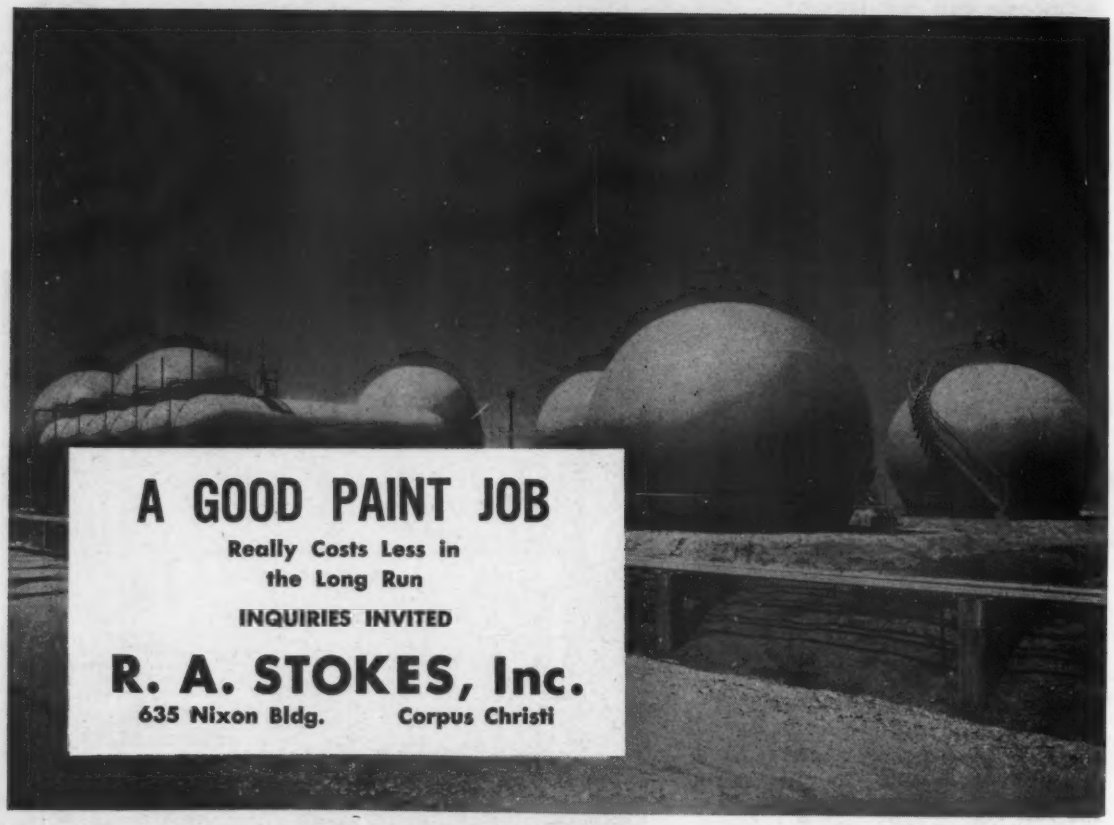

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Unusual Geology, With Multiplicity of Pay Zones, Features South Haldeman Field

by Charles J. Deegan

SOUTH HALDEMAN field in Jim Wells County, Texas, was opened by Magnolia Petroleum Corp. 1 D. Clark, formally completed February 12, 1947. Although it will probably not be a major field, present development and known geological conditions indicate a potentially proven reserve of the order of 10,000,000 bbl.

Geologically the field is unusual. It lies just west of Seeligson field (see Fig. 1), and like Seeligson is associated with the regional Sam Fordyce-Vanderbilt fault zone. The new field produces from a horst, i.e. an upthrust block of sediments, with downthrow faults on both sides, where the same sedimentary section is found at lower levels across the fault, as that in the upthrust block. (See Fig. 3.)

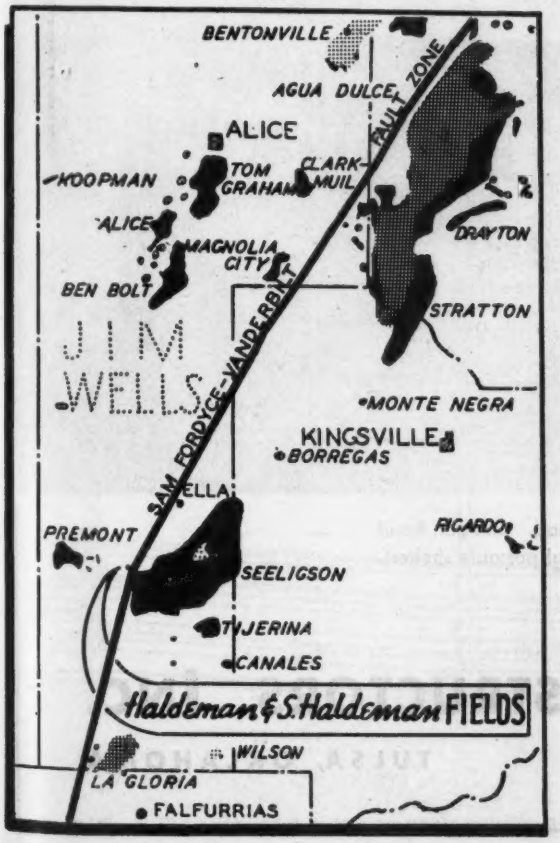
Seeligson, immediately east of the new field, is on the downthrow side of a fault. This is normal for the big fields associated with the Sam Fordyce-Vanderbilt fault zone. Large accumulations of oil are found in closures against the downthrow side of the fault, which is always toward the Gulf Coast. Any good reservoir sand body, particularly in the Frio section, is quite apt to contain either oil, condensate, or gas, or some combination of these, on a closure against the fault.

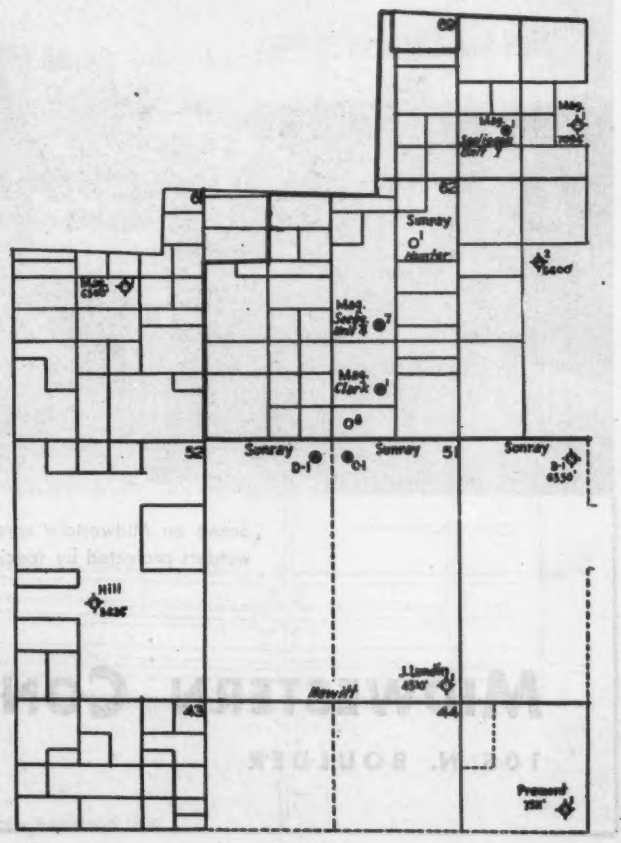
But South Haldeman, although on the upthrow side of the fault from one of the truly major accumulations of the United States (Seeligson field), has oil in substantial quantities in many of the same zones that produce in Seeligson. (Four such zones are proven, others appear highly probable as producers.)

The presence of this accumulation has been suspected since seismograph work in 1941 by Sunray Oil Corp. and Magnolia Petroleum Corp. indicated another downthrow fault some distance west of the main fault in the Seeligson closure, with evidence that there was also probably closure against the west, or regionally updip side of the block of sediments that was thrust upward between these two faults.

This was confirmed in February 1947 by the completion of the discovery well, Magnolia 1 Clark (See Fig. 2). Three more producers, with no dry holes yet, have been com-

Fig. 1—(Left) Position of South Haldeman field with respect to other fields in southwest Texas along Sam Fordyce-Vanderbilt fault zone.
Fig. 2—(Right) Map of South Haldeman field





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pleted since then: Magnolia 7 Seeligson Unit 4 completed April 25; Sunray Oil Corp. 1-C and 1-D Hewitt, completed respectively on June 9 and July 19. Each of these two operators has one rig active, Sunray 1 Hunter, a northeast outpost (See Fig. 2) and Magnolia 8, Seeligson Unit 4. This last well is a north offset to Sunray 1-C Hewitt.

The same multiplicity of potential pay zones of more or less lenticular sands has been found as in Seeligson field. However, there is a definite thinning in the upper section of the Frio as compared to Seeligson field. The exact location of the west side fault remains to be determined by actual drilling. There is also evidence of cross-faulting, which although minor compared to the main fault,

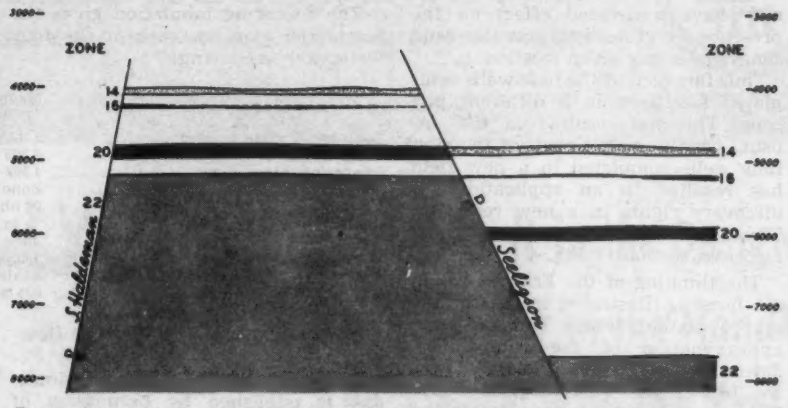

Fig. 3—Schematic diagram of horst, or upthrust wedge of sediments, showing approximate relationship of formations to those in main Seeligson field to the east on the downthrow side of the east fault

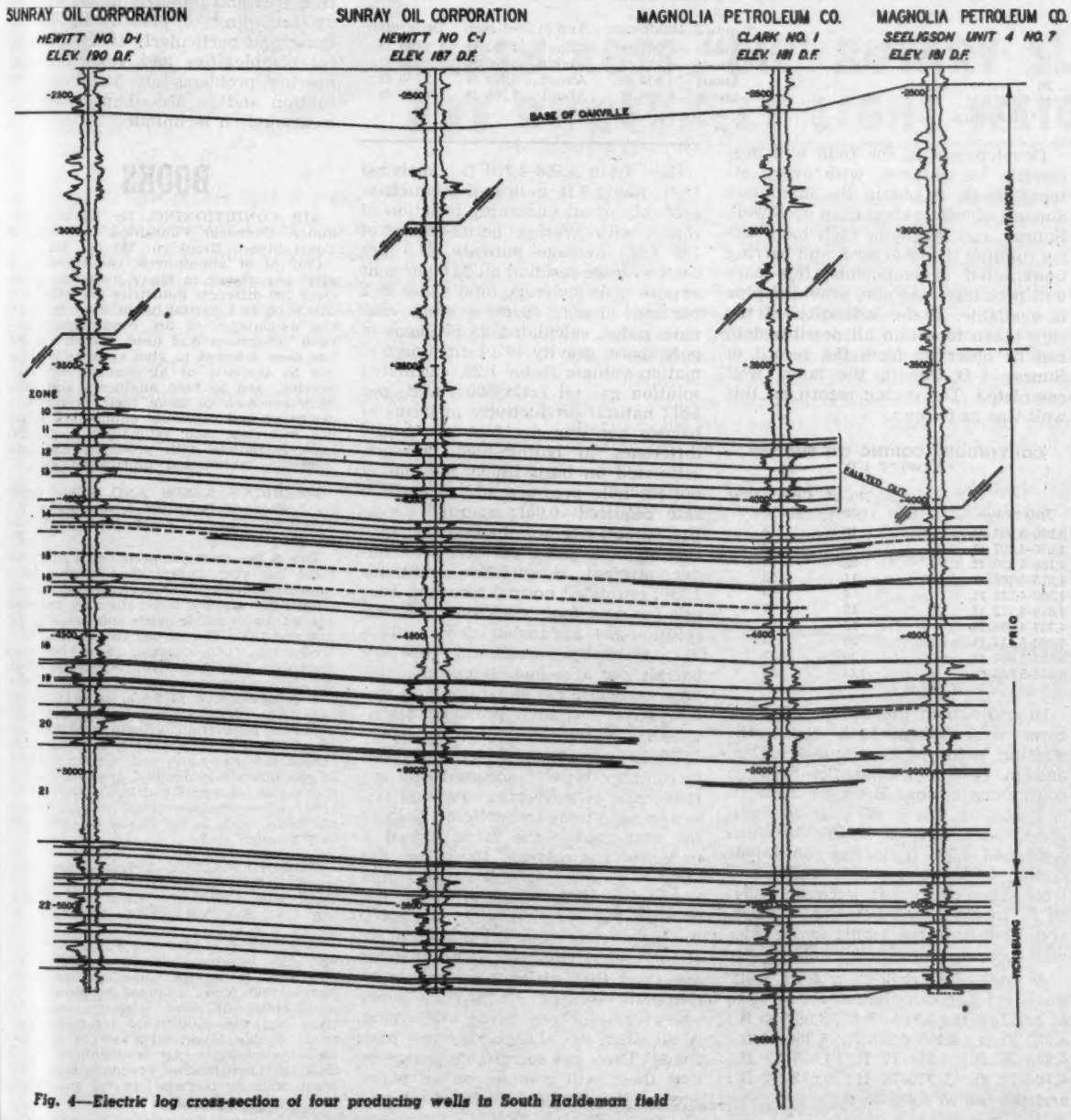

Fig. 4—Electric log cross-section of four producing wells in South Haldeman field

may have a decided effect on the presence or absence of specific sand zones under any given location.

Thus far, each of the four wells completed has been in a different pay zone. This has resulted in the unusual condition that each of the first four wells completed in a new field has resulted in an application for discovery rights in a new reservoir. This is shown clearly in the electric-log cross-section in Fig. 4.

The thinning of the Frio section in the horst is illustrated in the following tabulation, which represents an approximation of the comparative datum tops of various Frio zones, plus the top of the Vicksburg, in South Haldeman, with the same zones in the same structural position in Seeligson field to the east on the downthrow side of the east fault.

Zone	Top in S. Haldeman	Top in Seeligson	Difference
14	About —4,000 ft.	About —4,800 ft.	800 ft.
16	About —4,275 ft.	About —5,200 ft.	925 ft.
20	About —4,800 ft.	About —5,900 ft.	1,100 ft.
*22	About —5,250 ft.	About —7,700 ft.	2,450 ft.

*Vicksburg.

Development in the field will necessarily be cautious, with every attempt made to obtain the maximum amount of information from each well. Sunray and Magnolia each have one rig running the field now, and barring unexpected developments, this pace will probably continue, provided pipe is available. Some indication of the care taken to obtain all possible data can be observed from the record of Sunray 1-D Hewitt, the latest well completed. The coring record on this well was as follows:

CONTINUOUS CORING ON SUNRAY HEWITT 1-D

Interval—	No. of cores	Cumulative No. cores
3,850-3,995 ft.	18	18
4,070-4,097 ft.	4	22
4,185-4,320 ft.	22	44
4,375-4,460 ft.	11	55
4,500-4,525 ft.	4	59
4,648-4,772 ft.	18	77
4,787-4,865 ft.	10	87
4,950-5,133 ft.	26	113
5,452-5,604 ft.	20	133
5,644-5,848 ft.	25	158

In addition to the above, side-wall cores were taken, both above the starting point of continuous coring, and in two of the breaks between continuous coring. Between 2,585 ft. and 3,812 ft., there were 16 side-wall cores taken. In the break between 4,460 and 4,500 ft. in the continuous coring table above, side-wall cores were taken every 2 ft. between 4,464-89 ft. In the break between 4,865 ft. and 4,950 ft. in the tabulation, a side-wall core was taken at 4,945-46 ft.

A total of 13 drill-stem tests were made prior to completion. These were at 3,852-63 ft.; 3,910-17 ft.; 3,989-95 ft.; 4,082-97 ft.; 4,195-4,203 ft.; 4,204-11 ft.; 4,248-70 ft.; 4,511-17 ft.; 4,517-25 ft.; 4,764-72 ft.; 5,070-78 ft.; 5,078-84 ft.; and the last at 5,459-65 ft.

The following tabulation gives the completion data on each of the four wells now producing:

	Magnolia 1 Clark	Magnolia 7 Seeligson	Sunray 1-C Hewitt	Sunray 1-D Hewitt
Completion date	2/12/47	4/25/47	6/9/47	7/19/47
Total depth	6,505 ft.	6,001 ft.	6,006 ft.	6,000 ft.
Producing zone	4,502-10	5,563-67	5,150-55	4,205-11
Name of pay	Zone 15	Zone 22-A	Zone 20-C	Zone 14
I.p.	98 bbl.	54 bbl.	216 bbl.	124 bbl.
Choke	⅛ in.	⅛ in.	11/64 in.	5/32 in.
Gravity	48°	40°	46°	46°
Tubing pressure	750 psi.	300 psi.	840 psi.	320 psi.
Casing pressure	Sealed	(?)	1,200 psi.	810 psi.
Gas-oil ratio	605 cu. ft.	338 cu. ft.	912 cu. ft.	710 cu. ft.

A core analysis of Sunray 1-D Hewitt at 4,196-4,210 ft. was made by Petroleum Service Co. of San Antonio, and is published by permission of Sunray. The well is now producing from perforations at 4,205-11 ft.

Core from 4,196-4,210 ft.; analyzed 12 ft., found 9 ft. indicated productive, probably of oil (assuming isolation of zone); with average permeability of 109 md.; average porosity 27.5 per cent; average residual oil 22.6 per cent of pore space; average total water 59.2 per cent of pore space; average connate water, calculated 28 per cent of pore space; gravity 46°; estimated formation volume factor 1.26; calculated solution gas oil ratio 500 cu. ft. per bbl.; natural productivity in terms of barrels per day per foot per pound difference in bottom-hole pressure, estimated on basis linear relation of bottom hole pressure and production rate required—0.051; average porosity, barrels per acre-foot—2,134; barrels of oil in place per acre-foot, under original subsurface conditions, 1,536; estimated normal recovery, barrels per acre-foot, stock-tank volume, solution-gas expansion drive only—217; estimated maximum recovery barrels per acre-foot, stock-tank volume, complete gas expansion and water drive, original pressure maintained—737.

While estimates of such an unusually complex type of accumulation are hazardous at this stage, the similarities to conditions in Seeligson field to the east, across the fault, afford a basis for comparison. Based on the original seismic interpretation, plus the information obtained from the four producing and two drilling wells, the productive area is likely to be about 1,000-1,200 acres. The chances are good that ultimately each location will be found to have an average of four oil-pay zones underlying it, although not always the same four zones. There are reasonable prospects that these will contain, on an average, a total of about 40 ft. of oil column, and a total recoverable oil content of say around 10,000 bbl. per acre. This would put the field in the 10,000,000-bbl. class.

There are a great many ifs in this estimate, which can be summed up briefly about as follows: It will be a 10,000,000-bbl. field, if the productive area and number of pays proves up according to present interpretations, and particularly if the geological complexities and reservoir-engineering problems are handled with caution and in accordance with the most modern techniques.

BOOKS

AIR CONDITIONING. By Herbert Herkimer. Chemical Publishing Co., Inc., 26 Court Street, Brooklyn. 720 pp. $12.

Control of atmospheric conditions is of vital importance in many industrial fields. Over 200 different industries are offered in this book as a partial list of those in which the advantages of air conditioning have been recognized and used. Subject matter has been selected to give systematic training to students of air-conditioning engineering, and to help engineers and other technical men to solve their problems in designing and repairing equipment, selecting materials, and estimating costs. The book is replete with problems and their solutions, tables, and illustrations.

AMERICA'S NEEDS AND RESOURCES. By J. Frederic Dewhurst & Associates. The Twentieth Century Fund, New York. 813 pp. $5.

This is the most comprehensive study the Fund has ever undertaken. It presents a careful estimate of America's human and industrial capacity and resources balanced against the probable needs and demands for 1950 and 1960. The survey covers records of production, consumption, and economic change in the United States within recent decades, and in many instances it goes back into economic history as far as reliable records exist. It ranges over broadgaged basic data on population growth, national income, trends in employment, working hours, output per man-hour, and similar subjects. It gets down into detailed analyses such as indexes of passenger traffic, crop yields per acre, and consumption expenditures for single items, such as for shoes, in each year, 1909 through 1942.

COLLOID SCIENCE. A Symposium. Sponsored by the Department of Colloid Science, Cambridge University. Chemical Publishing Co., 26 Court Street, Brooklyn. 306 pp. $6.

This book is a study of disperse systems and gives interpretations of phenomena encountered in surface films and interfaces. Phases and phase changes in monolayers, multilayers, emulsion stability, adsorbed films and the solid-liquid interface, electrical double layer, structure of micelles, electroprophoresis, fat metabolism, X-ray analysis, identification of bonds and structural units by infrared spectra the important topics discussed.

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" O.D. Slips with 5⅝" Liners	146 lbs.	177 lbs.
O.D. Slips with 7" Liners	154 lbs.	196 lbs.

On these and other sizes you'll find Baash-Ross "DU" Rotary Slips are pounds lighter because all excess metal has been removed without in any way sacrificing strength or ruggedness. *Notice the deeply-cored backs that replace dead metal with a cellular rib construction that combines more-than-ample strength with minimum weight.*

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Baash-Ross "DU" Rotary Slips are available in both "Regular" length (12" long—for wells through 8000 ft. in depth)... and "Long" length (16" long—for the deepest wells and heaviest drill strings). For full details, see your nearest Baash-Ross representative—or write direct!

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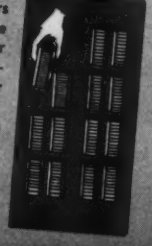
o, if for any reason slip wear is concentrated at one nt, liner segments can be switched or inverted to dis-ute wear without replacing any parts. Or if too worn, lace only the worn segments and use the others for addi-al service. Cuts maintenance costs to the bone!



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BEFORE YOU BUY ANY ROTARY SLIPS GET THE COMPLETE STORY ON "DU" ALL-AROUND SUPERIORITY!

Fire Train Poised for Action

NEWLY renovated and equipped with improved communication facilities, the foam train of the Port Arthur, Tex., Works, The Texas Co., is one of the few fire-fighting machines of its type found in industry in the whole country. It is practically custom build and was specially fitted in the plant.

The foam train, consisting of six cars strung together on a convenient siding, stands ready to roll at a moment's notice to any point in the company's large refinery. It also is poised to give emergency service at Port Neches Texaco plant and at the Port Arthur terminal.

Four times during the war the foam fighting equipment responded to fire alarms outside the plant.

In addition to the portable telephone sets with which the train has been equipped for many years, it now carries a public-address system complete with microphone and amplifiers so that an official easily may direct the fire fighting in the midst of the noise, bustle, and excitement.

The pump car, and four tank cars containing foam solution are connected with hose and are double coupled as a safeguard. It is the work of but a moment to couple on a locomotive and connect the steam lines to operate the big pump to hose the foam where it will do the most good. The sixth car is the utility car in which the crew rides with its equipment.

Switch Engines Available

Locomotives switching inside the plant are available around the clock to move the railroad pumper and solution tanks. Extensive trackage makes it possible to "spot" the train at advantageous points to supplement the foam streams from stationary equipment in the refinery.

The train is an important part of Texaco's general plant fire protection. It is almost equally important to Port Neches plant and the Port Arthur terminal, as well as nearby plants and industries which have asked for it in extreme emergencies.

It has been moved to spur tracks of the K.C.S. Railroad and hose laid to fires which were not accessible from the company's plant systems.

First assembled in 1915, the train at that time was made up of two 8,000-gal. tank cars and a box car in which a pump was mounted and circulating tanks and accessories were installed. In 1927 the pump car was replaced as such but kept as a utility car. Two more 8,000-gal. tank cars were added in 1928.

Now a new pump car and new utility car have just been placed in service. Capacity of pump is 480 gal. of foam solutions per minute, which expands from 7½ to 10 times—up to 4,800 gal. of foam—when ejected from the nozzle.

Plant Fire Marshal J. S. Dillinger and his men are proud of the war record of the foam train. In addition to helping put out four fires in the plant, it traveled outside the refinery five times to battle blazes between August 1942 and November 1943.

The longest mission the train made was to a fire which resulted from a derailment 20 miles north of Leesville, La., July 23, 1943. Twelve oil tank cars were ablaze and fire threatened the rest of the train. With a regular plant crew operating, the foam train chugged to the railroad conflagration and put it out in 4 hours.

Other outside wartime fire runs included another derailment near Nederland, August 27, 1942, two separate runs on December 29 and 30, 1942, to a refinery fire at Smiths Bluff, and another derailment blaze at Netchez Junction, near the rubber plant, November 13, 1943.

The Texas Co.'s fire-fighting (foam) train, Port Arthur works. The two tank cars carry chemicals, next is the car containing chemical pumps, then appears another chemical tank car and the utility-and-crew car. Interior view shows the mixing tank at end, and in foreground the steam pumps. Additional pumps are in other end of car. The men who man the foam train are (standing) Embree L. Windsor, Jimmie B. Richmond, Joseph D. Caillier, A. D. Bellow, Lewis McKinney, Jim Dillinger (plant fire marshal), and Marks L. Levy; (sitting), Theodore Rogers, Ingram McDonald, Charlie Arisco, Jose Espinoza, and Gardner J. Clark

Economics of Cycling

by W. H. Woods*

This is the concluding part of a discussion which began in last week's issue. The author estimates, for one example, the recovery by straight production as 27.7 per cent for the condensate and 35 per cent for the crude fractions, versus, by cycling, recoveries of 81.8 per cent and 50 per cent, respectively.

RECOVERY of products from gas-condensate reservoirs is primarily affected by the type of drive existing in the reservoir. There are two types of drive, water and gas. Water drive is defined as the encroachment of water to replace the gas and condensate produced from the reservoir. Water drive is said to be 100 per cent effective when it will maintain reservoir pressures regardless of the rate of withdrawal. However, as has been pointed out by authorities on the subject of reservoir mechanics, in order for a water drive to become 100 per cent effective as is the present case in the East Texas field there has to be an initial drop in reservoir pressure to cause water to flow into the reservoir. Thus even in reservoirs having so-called 100 per cent water drive there will be some loss from retrograde condensation as a result of pressure drop. In a gas-drive reservoir where there is no benefit of water encroachment the remaining gas will have to expand to replace the gas and condensate produced. In this case the loss of liquids due to retrograde condensation can be calculated accurately from so-called retrograde curves. The retrograde curve is a curve plotted of the produced condensate yield versus bottom-hole or reservoir pressure.

In a theoretically perfect water-drive reservoir the retrograde curve would be a single point showing the original yield of the produced reservoir fluid versus the original bottom-hole pressure. In other words the entire production from the reservoir would be taken at the original bottom-hole pressure and there would be no change in the analysis or condensate yield of the well fluid produced. In practice an effective water drive would require a small drop in pressure before becoming 100 per cent effective, and the retrograde curve would be short. The curve in this case would extend only from the virgin pressure to the pressure at which the water drive was effective. At that lower point the remainder of the production would occur without any change in composition.

Where no water drive is present the retrograde curve will be similar to that of La Blanca field and the composition will show a decrease with reduction of reservoir pressure to a point where maximum retrograde condensation takes place. Production beyond this point will result in an increase in condensate yield with reduction in pressure due to normal evaporation of the condensed liquids in the reservoir. Theoretically, were it possible to pull a complete vacuum on the reservoir, all of the material condensed would be vaporized and could be produced on the surface.

Calculation of Retrograde Losses

Losses due to retrograde condensation can be calculated for any drop in pressure by the simple determination of the area of the retrograde curve between the two pressures and a horizontal line intersecting the curve at the virgin pressure divided by total area below the horizontal line between the two pressures. An example of the retrograde loss at La Blanca field between a virgin pressure of 4,200 psig. and an end pressure of 1,000 psig. is 73.5 per cent.

Had it been possible to cycle the entire reservoir with only a small drop in pressure these losses could be reduced. As an example, if the reduction in bottom-hole pressure had been held to 200 psig. by reinjecting dry gas in sufficient quantities the loss from retrograde condensation as calculated by the area ratio method would have been only 22 per cent.

The composition of the reservoir fluid in gas-condensate reservoirs varies in each reservoir. Prediction of retrograde losses based on the production history of La Blanca would not be accurate. For this reason laboratories have designed and built apparatus so that change in composition of the well fluid for change in reservoir pressure can be reproduced on a small scale. The Gulf research laboratories pioneered this work and studies have been made on numerous reservoirs including those from fields in Texas, California, eastern Venezuela, Michigan, Louisiana, Mississippi, and Oklahoma. All of these studies include retrograde curves from which are calculated the losses due to condensation in the reservoir. Not only do they show the retrograde curves for condensate but they also show the curves for the iso and normal butane, iso and normal pentane, hexanes, heptanes, and heavier. The reports also contain analyses of the composition of the well fluid with respect to reservoir pressure from which propane recoveries can also be calculated.

It will be noted that in these investigations none of the retrograde curves is as steep at the start as was the extrapolated curve for La Blanca field. All the retrograde curves from these reservoir studies show a gradual sweep at the start of the curve which become steeper with further drop in reservoir pressure.

In cycling operations the loss of liquids as a result of retrograde condensation is a function of drop in reservoir pressure. The drop in pressure results from the following causes:

1. Shrinkage or extraction loss which is in the order of 35 cu. ft. per gal. of liquid saved.
2. Plant and field-development fuel requirements causing reduction in volume of gas available for return to the formation.
3. Difference in the deviation from perfect gas of the reservoir fluid and the dry gas.
4. Sales of low-pressure vapors flashed from the condensate and absorption oil not returned to the formation because of high cost for compression.

Factors to Consider

In some reservoirs being cycled, rich in condensate yield, the gas-injection rate is maintained equivalent to the volumetric rate of production. In these cases the shrinkage loss, fuel requirements, and other losses are made up by gas from outside sources. Usually in most cycling locations, small reservoirs separate from the reservoir being cycled are encountered which are not economically suited for cycling and the gas from them can be used for makeup purposes. There has been considerable discussion of introducing water into cycling operations for the purpose

*Division gas engineer, Houston division, Gulf Oil Corp. This paper is from the technical program at the production engineering conference of Gulf Oil Corp. held in Pittsburgh, May 12-17, 1947.

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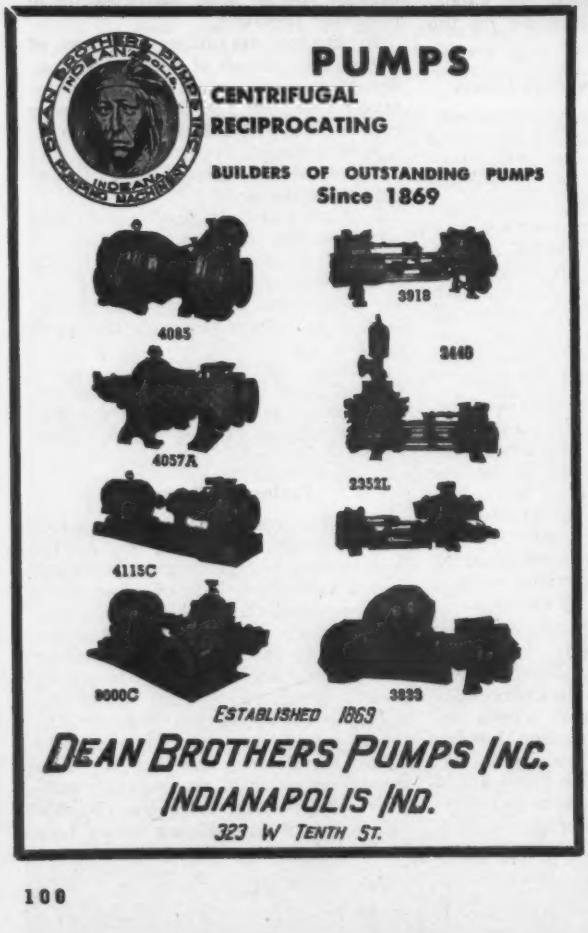
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of maintaining injection rates but as yet no such application has been tried on a commercial scale.

A direct comparison of the retrograde loss by straight production method with that calculated by cycling, with or without makeup gas from outside sources, is erroneous. The reason is that in cycling operations bypassing of wet gas will occur. The amount of bypassing can be calculated but liquid content bypassed will not be entirely lost as subsequent production of the reservoir will permit production of the bypassed gas and only that condensed in the reservoir as a result of retrograde condensation will be lost. As an example, in the results of the model reservoir study of a field in Louisiana contained in Table 2 the amount of isobutane and heavier content of the well fluid is given as 16,400 bbl. per million cubic feet of reservoir pore space. The recovery of this product by pressure depletion to 500 psig. with an efficient gasoline-extraction plant is calculated at 8,830 bbl. per million. The loss due to retrograde condensation in the formation would be the difference between these two figures or 8,100 bbl. The calculated recovery by cycling with a similar extraction plant based on a pressure loss of 10 per cent due to extraction and plant fuel with 30 per cent bypassing is estimated at 11,080 bbl. of isobutane and heavier hydrocarbons per million cubic feet. This represents a recovery of 67.5 per cent of the original amount of this material in place. However, the well fluid amounting to 30 per cent containing 4,900 bbl. will not all be lost from bypassing because by subsequent production during the blowdown period after cycling it is estimated that there will be an additional recovery of approximately 2,335 bbl.

Thus it is seen that to the losses by retrograde condensation in the reservoir during cycling must be added additional retrograde condensation losses occurring after pressure depletion of the bypassed wet gas during the blowdown period. While it may be possible to reduce the first losses to a minimum by makeup-gas injection from outside sources the second loss can only be decreased by reducing the amount of bypassing. Bypassing occurs by (1) inefficiencies in the cycling pattern, and (2) as a result of dry gas sweeping through more permeable layers in the reservoir. Both types of bypassing can be evaluated.

Cycling-Pattern Bypass Losses

Bypassing of wet-gas pockets will result from any cycling pattern selected. In general, this type of bypassing can be reduced by use of a larger number of wells in the pattern. However, production and injection wells are expensive and there is an economic limit in the number of wells to be used. In order to calculate the amount of gas bypassed it will be necessary to use an electrolytic model to measure the gas-invasion pattern.

The selection of the type of cycling pattern as to center injection, injection along the periphery or end sweep depends on:

1. Recovery of crude oil generally present in varying quantities in all gas condensate reservoirs.
2. Use of existing wells drilled in the discovery and delineation of the reservoir.
3. Capacity of wells for production and injection.
4. Physical features or irregularities of the reservoir such as: (a) location of faults, (b) variation in thickness of the producing section, (c) direction of water encroachment, (d) location of shale breaks, impervious streaks, etc.
5. Daily capacity of the plant.

The selection of the cycling pattern is in itself an economic study which requires thorough understanding of reservoir mechanics.

Sweep Efficiency Bypass Losses

Bypassing of wet gas will also result from sweep of dry gas through more permeable portions of the producing section. The bypassing caused by inefficiencies of pattern selection is left in pockets. That type of bypassing could be approximated by results of electrolytic model studies. The type of bypassing caused by dry gas sweeping through zones of higher permeability leaving wet gas in zones of low permeability can be calculated by correlating permeabilities determined from core analyses. A recent calculation made for a field in Mississippi showed that by the time the production gas is 50 per cent diluted the reservoir will be approximately 70 per cent cycled.

This type of bypassing results because of the fact that the reservoir is not homogeneous and vertical permeabilities are low if not zero. In order that a reservoir may be cycled it is axiomatic that to recover wet gas, dry gas must be caused to displace the wet gas from the reservoir. Thus, injection, as well as production, must be so planned that all of the section be opened. In order to reduce this type of bypassing it will be necessary to control production of dry gas after it appears in the well bore of producing wells. Efforts are now being made to this end by the use of packers.

The type of bypassing losses discussed are those applicable to cycling operations. The resultant recovery for cycling operations can thus be compared with that of pressure depletion where a natural water drive does not exist. However, the recovery of the various products by straight production methods where water drives are present sufficient to support desired withdrawals will also be subject to losses due to bypassing not only of the pocket type but also of the sweep type. The bypass losses in water-drive reservoirs will not be partially recovered in cycling in gas-drive fields and may well be of such magnitude that cycling in water-drive fields may be justified.

Evaluation can now be completed on the gas-condensate reservoir. Quantities of the various types can

TABLE 2—PROPOSED PLANT
Daily Gross Revenue From Natural Products

Product—	Production (gal.)	Present sales price	Daily gross revenue
Propane	33,650	$0.025	$841
Butanes	38,450	0.03125	1,202
Debutanized condensate and crude oil	120,700	0.04286	5,173
Total	192,800	*$0.03743	$7,216

*Average.

TABLE 3—PROPOSED PLANT
Daily Gross Revenue From Specialty Products

Product—	Production (gal.)	Present sales price	Daily gross revenue
Propane	33,650	$0.025	$841
Isobutane	13,250	0.03125	414
n-Butane	25,200	0.03125	788
Isopentane	11,000	0.08710	958
n-Pentane	8,000	0.06385	638
Hexane	5,950	0.07315	435
Heptane	7,950	0.0685	545
Textile spirit	13,900	0.0685	952
Heavy naphtha	53,350	0.04525	2,414
Gas oil	20,550	0.0406	834
Total	192,800	*$0.04508	$8,692

*Average.

TABLE 4—ESTIMATED RECOVERIES OF LIQUIDS

Method of production—	Recoveries of liquids condensed from gas		Crude oil	
	%	Bbl.	%	Bbl.
Straight production (no water drive, no plant)	27.7	5,623,000	35	3,405,000
Straight production (with gasoline plant)	53.8	10,921,000	35	3,405,000
Cycling with gasoline plant and subsequent blow down	81.8	16,605,000	50	4,864,000

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The 2"-1,000 lb. test pressure Orbit Forged Steel Valve is recommended for use on loading racks, bulk storage and lines handling gasoline, butane, propane, etc.

The installations shown here are all Orbit Forged Steel Valves No. F-201, 2"-1,000 lb. test pressure, equipped with stainless steel stems. This valve is available with screwed ends or flanged ends.

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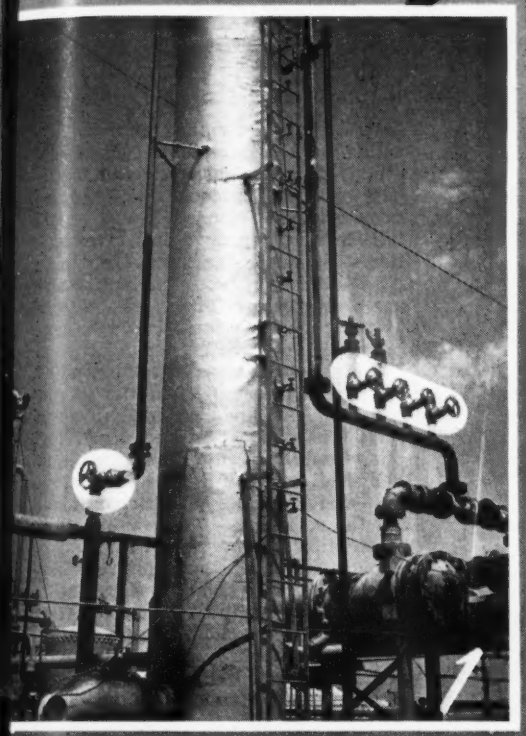
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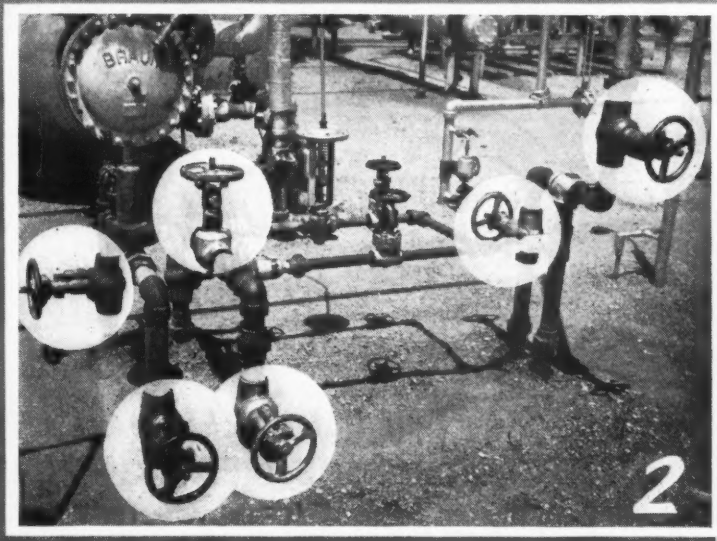
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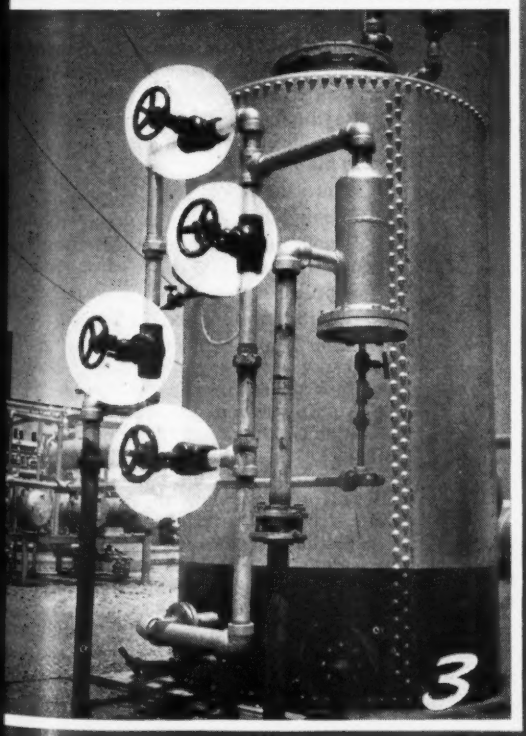
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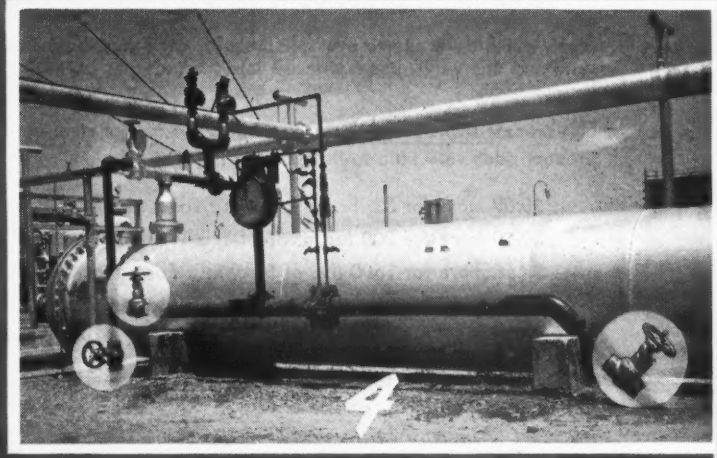
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be estimated by applying the recovery factor for each method of production to the amount of each product in place.

Participation factors based on values in place or on calculated recovery values can be calculated for unitization plans.

Net Realization of Straight Production

In order to determine the net realization of a gas-condensate reservoir produced by straight production methods the first approach should be an investigation of the marketing possibilities for dry gas. In this investigation it should be determined by years, if possible, the maximum and average delivery rates of dry gas as well as the revenues which could be expected.

With these data as a starting point the cost of producing facilities should next be estimated. Included in costs should be production wells, gasoline plant and lines, desulfurization and dehydration facilities, product storage, delivery lines, etc. In considering the economics of a gasoline-plant installation in connection with the gas delivery the value of high recovery of light ends (propane and butanes), stabilization of the condensate (debutanization), and other studies should be carefully made. It might well develop that the gasoline plant may not be economically justified, as has been the case in the operation of some gas-condensate reservoirs.

Having determined revenues and investment costs the next step is the determination of operating expense for the life of the reservoir. Items of operating expense should include:

1. Royalty payments on all products (gas, propane, butanes, condensates, and crude oil).
2. Operating labor.
3. Repair labor.
4. Repair material and other repair expense.
5. Supplies.
6. Hauling, water, and fuel.
7. Other miscellaneous operating expense.
8. Supervision prorated.
9. Administration prorated.
10. Plant exhaustion (depreciation).
11. Taxes.
12. Insurance and losses.

Based on these data the net realization from the straight production to depletion can be calculated. Payout calculation should not include prorata overhead, depreciation, and interest charges on funded debt.

Net Realization of Cycling

In like manner the net realization of cycling operations should be investigated. Instead of using the available market of dry gas as a basis, as was the case in the previous study, the economic size of the plant will govern. The size of the plant will be affected by the following:

1. Capacity of wells for production and injection.
2. The recovery of oil from the reservoir.
3. Life of the gas-condensate reservoir to be cycled.
4. Possibility of utilization of the plant for cycling other reservoir fluids at its proposed location.
5. Market possibilities for sale of dry gas after cycling operations have been completed.
6. Disposition of products.

In consideration of the type of plant, here again, the extraction efficiency of the light hydrocarbons, stabilization of condensate, type, and marketing facilities for the various products to be produced should all be carefully considered.

As an example, in making a preliminary study of the type of products to be produced from a field to be cycled two alternates were considered. Table 2 shows the daily revenues derived from the marketing of natural products. Table 3 shows the daily revenues derived from marketing specialty products.

Another consideration affecting the cost of the plant is the design of the gas-gathering and injection system. The advantage of installing individual lines to each well which can be used for either injection or production service and allow for individual measurement and testing at the plant over the installation of integrated gathering and injection systems with measurement and testing at the wells should be considered. Location of the plant will also affect the installation cost with respect to proximity to existing transportation facilities, product-loading facilities, water supply, etc. The net realization from cycling operations would be the total realization from cycling the reservoir together with that from producing the reservoir to final depletion less all operating costs of the cycling operation and subsequent production after cycling. Investment costs will be retired through depreciation or exhaustion charges. Payout calculations will of course exclude depreciation charges, interest charges on funded debt, and prorata overhead charges.

Economic Gain for Cycling

The economic gain for cycling over straight expansion is the difference between the net realization of each method and production less interest on referred sales. However, if there are legislative or regulatory barriers to the straight production method, such charges of interest on the value of deferred sales should not be included in comparing the advantage of one method of production over the other.

As an example, the results of a preliminary study of the field referred to above showed that the quantity of gas-condensate fluid in place under virgin conditions was approximately 312 billion cubic feet of fluid containing 20,300,000 bbl. of recoverable plant liquids and 9,728,000 bbl. of crude oil.

Based on the results shown in Table 2 of the model reservoir study the recovery factor for separator liquid is 27.7 per cent. By the addition of a gasoline plant the recovery of all plant products is increased to 53.8 per cent. Furthermore the installation of cycling facilities with subsequent production of the reservoir to depletion will cause an additional increase in recovery to 81.8 per cent. The recovery of crude oil is estimated at 35 per cent for straight production with or without a natural gasoline plant and 50 per cent for cycling. Table 4 shows the estimated recoveries of the liquid products for all three methods of production.

Based on present prices the net realization for a gasoline plant is approximately $2,282,000 increase over that of straight production without a plant. Cycling causes a further increase in net realization of approximately $6,280,000.

Accident Severity: Injury Index

*by Henry W. Boggess**

ACCIDENT-FREQUENCY rates were discussed in the May 2 issue of The Oil and Gas Journal. There are two other rates commonly used in the petroleum industry to evaluate the effectiveness of an accident-prevention program:

1. Accident-severity rate
2. Injury-index rate

Accident-severity rates are designed to determine the ratio of time lost because of disabling injuries to total time worked. To compute accident-severity rates, three factors are taken into consideration: (1) Actual number of days lost (including "weighted" days according to A.S.A. code for deaths and for partial and/or total permanent disabilities); (2) a standard of measurement; (3) actual man hours of exposure.

1. Days lost are the actual days lost from work **beyond** the shift or tour during which the accidental injury occurs, plus "weighted" days, if any, for partial and/or total disabilities. (Weighted days means the adding of days to equalize the severity of permanent injuries, either partial or total, such as the loss of an eye, a hand, an arm, leg, etc., on up to and including death. For instance, an injury may result in death 3 days after the accident; for such case the total number of days charged will be 6,000, 3 of which are actual and 5,997 of which are weighted. American Standards Association or National Safety Council will furnish, upon request, table of weighted days to be used in computing severity rates.)

2. The generally accepted standard of measurement recommended by American Standards Association, National Safety Council, American Petroleum Institute, and other national bodies, and exclusively used by practically all American industries is 1,000 hours of work.

3. Actual man hours of exposure including all hours worked by all employes during the period for which the rate is computed, such as a given month, a calendar year, etc. All such time worked covers "exposure to hazards."

A severity rate is determined by multiplying the number or days lost (including weighted days) by 1,000 (the standard of measurement) and then dividing the product by the total number of man hours worked during the period. Formula:

$$\text{Accident Severity} = \frac{\text{Days lost} \times 1{,}000}{\text{Man hours of exposure}}$$

Injury index is another measuring stick currently used by the A.P.I. which theoretically combines both accident frequency and accident severity rates for the purpose of determining the over-all effectiveness of an accident prevention program. Injury index is computed by adding frequency rate to 10 times severity. Formula:

Injury index = Frequency plus 10 times severity.

*Superintendent Employment-Insurance-Safety, Sinclair Prairie Oil Co.

Sohio Awards Contract

Contract for catalyst case repair and catalyst change in the Houdry catalytic cracking unit of Standard Oil Co. of Ohio has been awarded to Catalytic Construction Co. The unit takes 20,000 bbl. per day charge and is located in Sohio's refinery at Cleveland.

QUESTIONS on TECHNOLOGY

by W. L. Nelson

Consulting Engineer

This department was created for the purpose of aiding managers, superintendents, engineers, chemists and all those engaged in various phases of plant operation, as well as those connected with the marketing and utilization of petroleum products. Readers are invited to submit their problems to W. L. Nelson, technical editor. Inquiries must be signed, but only the initials will be printed.

Elements of Water Treatment

We have an opportunity to replace our pond water-cooling system with a closed one. What are the things we should be watching for? F.C.R.

The subject of water treatment is such a large one that only certain almost-obvious factors can be enumerated here. Among the agents or situations that may be encountered are the following:

Sediment, mud, etc.—To some extent these materials tend to cause incrustations on heating surfaces, particularly in boilers, and always tends to accumulate at low points such as cooler boxes, hot wells, cooling tower pits, etc. Sand filters may be used but settling tanks or natural points of accumulation may be drained or washed down at regular intervals.

Organic matter.—Such material, particularly sewage, leads to corrosion and to foaming in boilers. Settling tanks or filters are used and a coagulent such as alum, iron alum, or potash alum are usually advisable.

Grease, oil, etc.—This leads to corrosion and incrustation in boiler systems and in general to the "fouling" of heat-transfer surfaces. Filters of sand or filter clay are needed in preparing boiler feed water, and a small amount of alum and caustic soda is added *(see Questions on Technology, The Oil and Gas Journal, December 14, 1946, page 87, entitled "How to Detect Contamination of Steam Condensate With Oil")*. Difficulty with steam condensate can be avoided to some extent by the use of oils that do not tend to emulsify (low or good demulsibility test, Fed. Method 320.32). In refineries, oil leaks are common and hence some point of accumulation and overflow should be provided by which large "spills" can be drained to the sewer through the refinery settling system.

Highly soluble salts. — Large amounts of sodium chloride (common brine), sodium sulfate, sodium carbonate, or similar salts lead to priming and embrittlement in boilers and in general lead to corrosion if present in large quantities. Sodium carbonate is particularly troublesome for boiler service if present in large amounts, so troublesome that a new water supply should be sought. Use of the zeolite process, if used on extremely hard waters, leads to difficulty with soluble salts. Calcium carbonate, which is changed to sodium carbonate by zeolite treatment is the major component of most hard waters and hence if it is removed by treatment with lime, the smaller amounts of sodium sulfate produced in zeolite treatment are not troublesome. Accumulations of soluble salts can, of course, be eliminated from boilers by regular blowdowns. Dezincification of copper-base alloys has occasionally been reported.

Magnesium chloride and sulfate.—These tend to cause corrosion by the evolution of hydrochloric acid and hence an excess of sodium carbonate may be maintained.

Bicarbonates of lime and magnesia.—These cause boiler scale and suspended matter that must be eliminated from boilers by blowdown. They may be eliminated in part by heating the feed or by the use of zeolites, but the common method of removal is to add lime and soda. Some refiners convert bicarbonate found in surface water used for makeup water for cooling towers, into soluble sulfate with sulfuric acid.

Sulfate of lime.—This produces tightly adhering scale upon heated surfaces and it can be eliminated by the addition of caustic soda. Less frequently zeolites or barium carbonate are used.

Algae growths.—The growth of these organisms in cooling systems is usually regulated by controlling the acidity of the water.

For large boiler installations all of the above items are cared for by the use of coagulants, sand filters or settlers, and treatment with lime and soda (occasionally with barium carbonate). Zeolite treatment, even though it increases the total solids and is slightly more expensive, is used widely for small boiler installations because of its simplicity. The saving in labor or supervision by the zeolite process compensates for disadvantages of the process. In refinery cooling tower systems the current elimination of sediment, control of algae, and trapping of oil leaks are most significant although the removal of calcium and magnesium carbonates and sulfates can be justified in many installations.

Vapor Pressure Chart for Hexane-Plus Fraction

In determining the vapor pressure of a hexane-plus fraction, what is the relationship between specific gravity and vapor pressure at 100° F? D.D.E.

See Fig. 1, which is based on the specific gravities and vapor pressures of common hydrocarbons that may be found in the hexane-plus fraction. The circle points are for normal paraffin hydrocarbons and the large points are for hydrocarbons with single methyl attachments. The less common

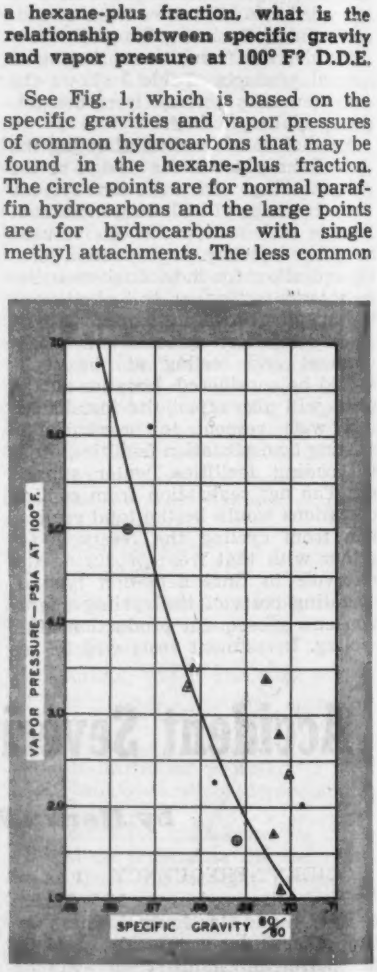

Fig. 1—Approximate relationship between specific gravity and vapor pressure of hexane-plus fractions

di and trimethyl straight-chain hydrocarbons are shown as triangle points. The curve should be sufficiently accurate for most natural-gasoline-plant computations.

Relative Permeability Measurements On Small Core Samples

by R. A. Morse, P. L. Terwilliger*, and S. T. Yuster**

A GREAT deal of research work has been devoted to the development of the fundamental concepts necessary to a more complete understanding of the mechanisms involved in the production of oil and gas from natural reservoirs. One of the most important of these has been the concept of relative permeability, the fractional portion of the reservoir permeability which is available for flow to some given fluid in a multifluid system such as oil, connate water, and gas. The relative permeability of a given sand to one of several fluids present in it is understandably dependent upon the saturation of those fluids, and for different sands it is to be expected that relative permeability will vary for a given fluid saturation.

While these qualitative facts are known, quantitative data are necessary for applying the relative-permeability concept. In primary recovery, the relative permeability at a particular connate water and oil saturation is necessary in order to predict oil production. In secondary-recovery work, it is desirable to know the relative permeability as a function of fluid saturations in order to predict the rate at which the sand will take the drive fluid and therefore predict the rate of oil recovery.

*Division of petroleum and natural-gas engineering, The Pennsylvania State College, State College, Pa.

Expensive and Difficult

The relative permeability-saturation data include the equilibrium saturations or the maximum nonflowing saturation of a given fluid in the sand. The equilibrium-water saturation should be equivalent to the connate-water content of an unflooded sand. The equilibrium-oil saturation (with only water and oil in the sand) should be the same as the residual oil after the completion of a water flood.

As important as relative permeability is in both primary and secondary recovery, no extensive use has been made of this concept chiefly because of the expense and difficulty of obtaining the data on the usual samples available for analysis. Hassler, Rice, and Leeman[1] measured relative permeabilities to gas on small (2 cm. diameter by 2 cm.) Bradford sand cores initially saturated with oil. Their work was done by gas driving the small oil-saturated cores at a pressure differential of 40 psi., measuring the rate of gas production, and determining the oil saturation after each run by weighing the core sample. Extensive studies have been made by Leverett[2,3] of the behavior of unconsolidated sand systems (long packed tubes) in which the two phases, oil and water, and the three phases, oil, water, and gas, were flowing in the sand simultaneously. Botset and Muskat[4,5] reported similar studies of the behavior of gas-water mixtures flowing in both unconsolidated and consolidated sands.

From these fundamental studies a number of mathematical relationships have been derived to predict the performances of natural reservoirs under almost all possible conditions, both natural and induced. However, the development of the mathematical analysis has far outstripped the acquisition of sufficiently precise laboratory data to allow complete and dependable prediction of oil-reservoir performance from these analyses. One of the most important variables, for which only very meager data are available on actual reservoir samples, is the relative-permeability relationship for the various fluids under reservoir conditions. The only published method[6] available to date for the determination of such data is of such complex nature as to make its cost prohibitive for routine determinations. Also, there has been considerable discussion as to the validity of results obtained by the use of semipermeable membranes (applied in the above method) to control the flow of the fluids used. Most assuredly the contact with the core sample of a porous diaphragm of very different capillary pressure from that of the core sample will result in a saturation variation in the core during flow tests. The seriousness of the effect of that saturation distribution within the core upon relative-permeability measurements is a matter for conjecture since no published detailed study of it is available.

The work reported herein was undertaken in an effort to develop a simple apparatus and method for the determination of reliable relative permeability measurements on small core samples as a routine laboratory procedure.

The method derived for the per-

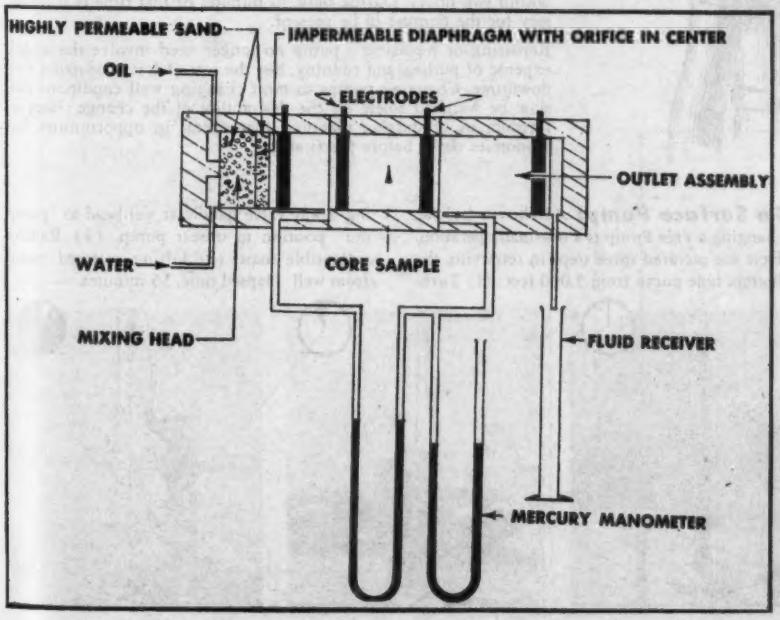

Fig. 1—Relative-permeability apparatus

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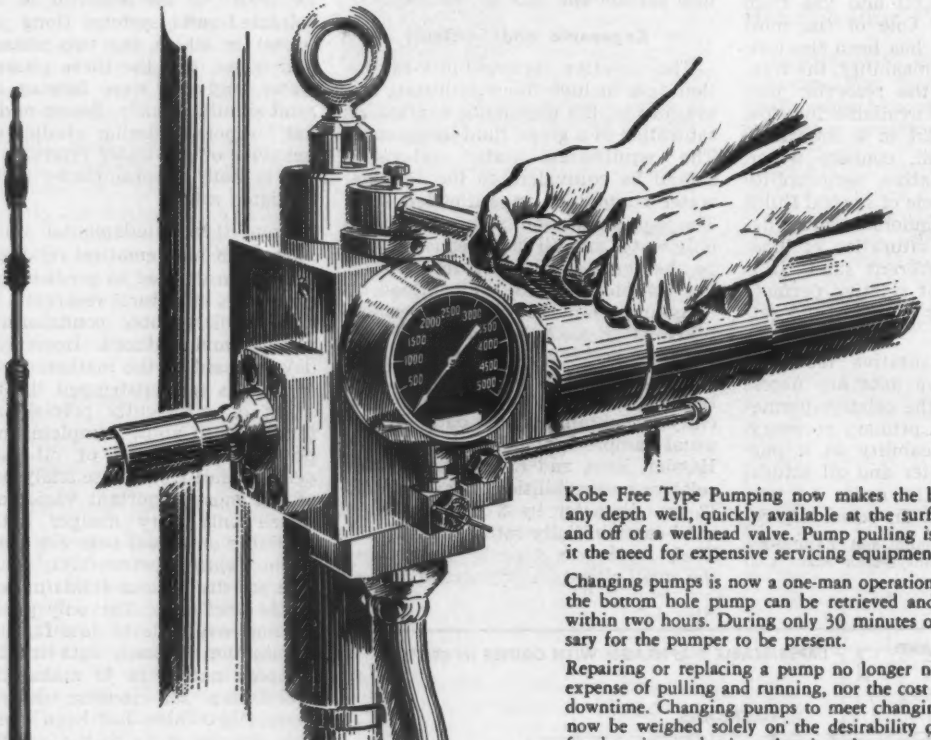

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Repairing or replacing a pump no longer need involve the added expense of pulling and running, nor the cost of lost production and downtime. Changing pumps to meet changing well conditions can now be weighed solely on the desirability of the change. Here is freedom in production planning that opens up opportunities for economies never before practicable.

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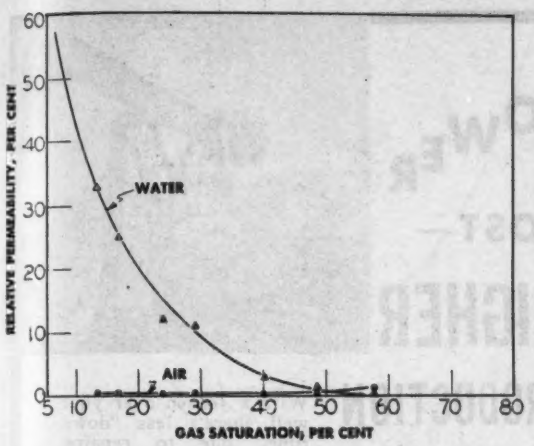

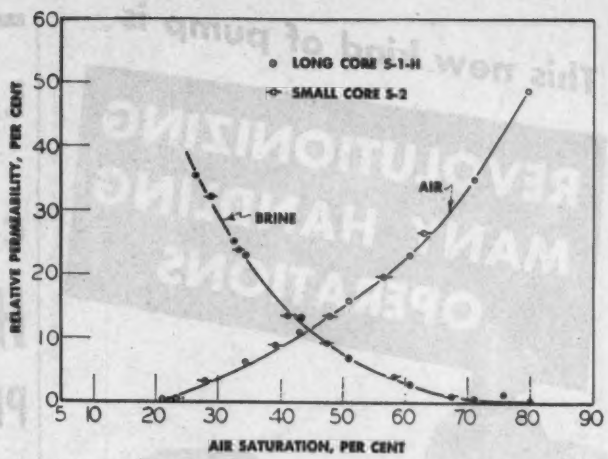

Fig. 2—(Left) Air-brine permeability, small synthetic core S-2. Fig. 3—(Right) Air-brine relative permeability on synthetic cores

meability tests was based on the assumption that it should be possible to attain sufficiently intimate contact between two flat surfaces of the same sandstone to eliminate entirely any boundary effect which might affect flow. With this in mind, it was planned to encase the sample core in Lucite and insert it, for flow tests, between two pieces of the same sand similarly encased in Lucite.

Pictured schematically in Fig. 1 is the system with which the work reported herein was done. The mixing head, in which simultaneous flow of two fluids is established, consists of two separate inlet chambers in the Lucite in contact with a disk of highly permeable sand (about 8 darcies), followed in turn by a diaphragm of impermeable material with a 1/16-in. hole in the center, another disk of the very permeable sand, and a core of the same sandstone as the test core, to which an electrode consisting of a band of gold-plated brass is attached. With this mixing head it is possible to establish simultaneous flow of two fluids evenly distributed over the cross section of the inlet of the test core.

Preliminary Tests

The preliminary tests were conducted with a mixing head which was made without the second disk of permeable sand, but, at high flow rates, the short length of core following the diaphragm failed to evenly distribute the flowing fluids over the entire cross section of the core at the outlet of the mixing head. The fluids had a decided tendency to emerge from the mixing assembly in greater amounts from the same side of the core into which they were being injected than from the opposite side at high rates of throughput. With the mixing head as shown in Fig. 1 this tendency was eliminated entirely. The outlet face of the sandstone of the mixing head was ground absolutely flat and perpendicular to the axis of the core by the use of a tool-grinding attachment on a machine lathe. After the rock surface was ground flat, the surrounding Lucite was cut away with a round-pointed cutting tool until it was protruding only 0.0005 in. beyond the sandstone. Both ends of the sample core, as well as the inlet end of the outlet assembly, were similarly machined. Therefore, there is 0.0010 in. between the mixing head sand and the sand of the plug. When under pressure, the Lucite must compress the 0.0010 in. to give sand-to-sand contact. The outlet assembly consisted merely of a core of the same sand as the test sample, with an electrode attached, mounted in Lucite with a chamber at the outlet end with connections for the fluid outlet. Both the mixing head and the outlet assembly were provided with manome-

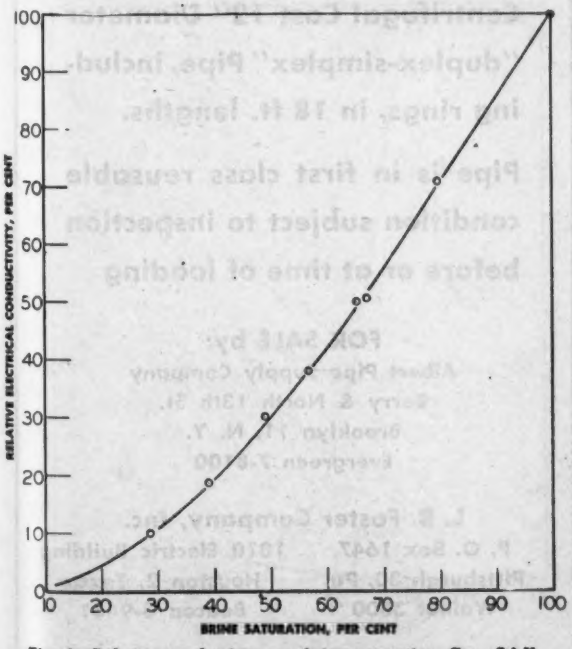

Fig. 4—Relative conductivity vs. brine saturation, Core S-1-H

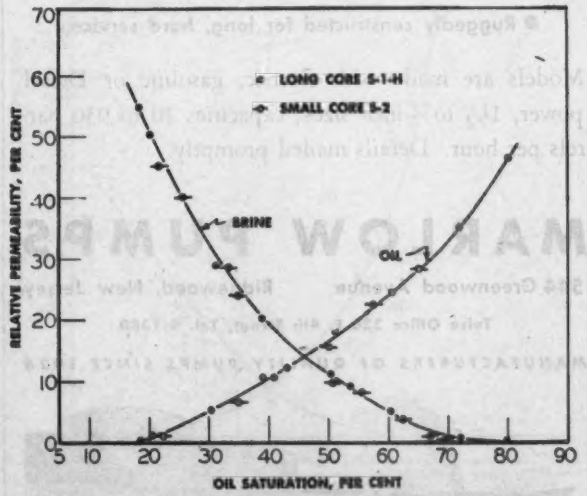

Fig. 5—Oil-brine relative permeability on synthetic core

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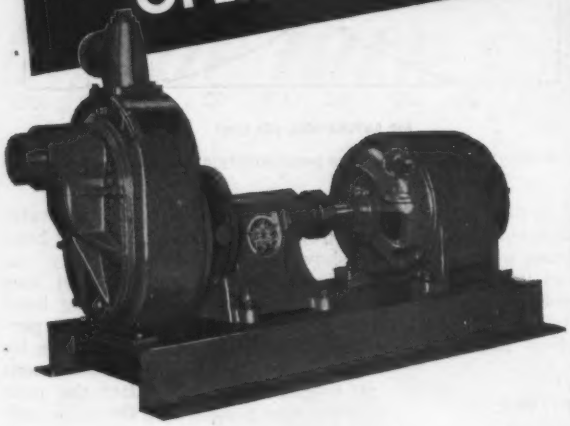

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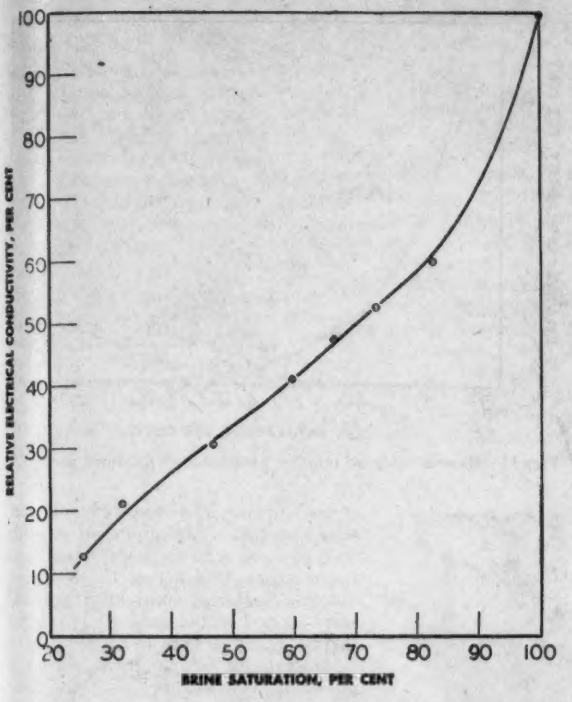

Fig. 6—Relative electrical conductivity vs. brine saturation, Venango core B-1-A

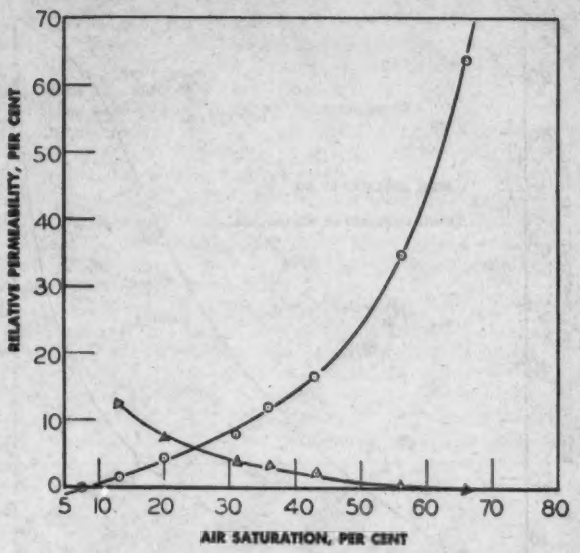

Fig. 7—Air-brine relative permeability, Venango core B-1-A

ter connections, as shown in the diagram, to measure the pressure at the ends of the sample core.

The chambers in the mixing head and outlet assembly were made by affixing a disk of magnesium metal of the desired shape to the core before mounting in Lucite. Baker casting resin No. 100,092, a thermosetting plastic, was used to affix the magnesium to the sand, and to seal the contacts between the adjacent elements of the mixing head against Lucite penetration during the mounting process. The resin was allowed to thicken considerably before applying in order to prevent its penetration.

The Lucite mounting was accomplished by placing the sample in a regular 1¼ in. i.d. metallurgical specimen mounting cylinder, pouring Lucite molding powder around the sample, raising the temperature to 140° C. and applying 5,000 psi. pressure. Upon cooling, the mounted core was easily extruded from the cylinder. Holes were drilled and tapped for the necessary manometer and fluid connections. Very dilute acetic acid was then used to dissolve out the magnesium. The units were cleaned by flowing through several pore volumes of water and clean heptane, followed by passing dry air through until each unit was dry. The whole assembly was mounted for these tests in a clamping device to which the mixing head and outlet assemblies were held by two specially designed chucks. During flow tests the faces of the cores were held together, providing a leak-tight Lucite-to-Lucite seal, by means of pressure applied

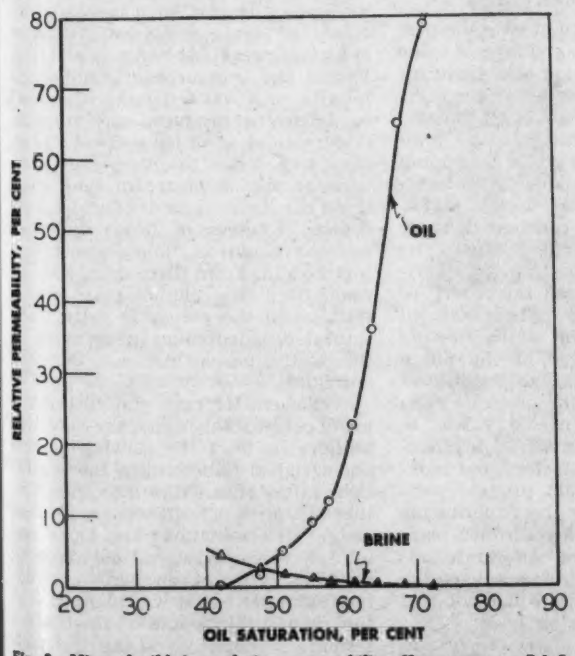

Fig. 8—Mineral oil-brine relative permeability, Venango core B-1-A

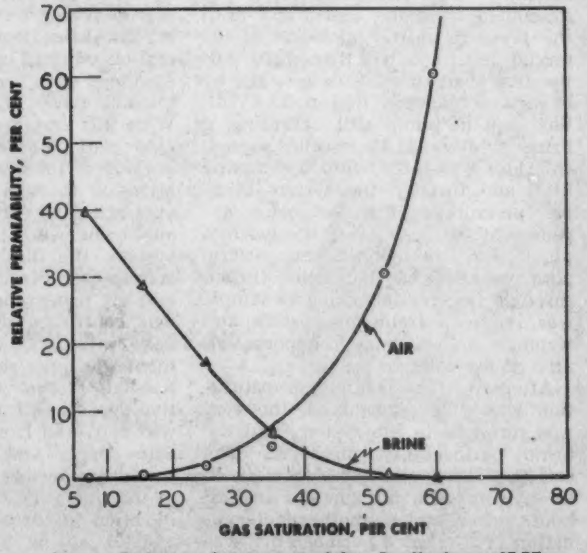

Fig. 9—Air-brine relative permeability, Bradford core 27-BT

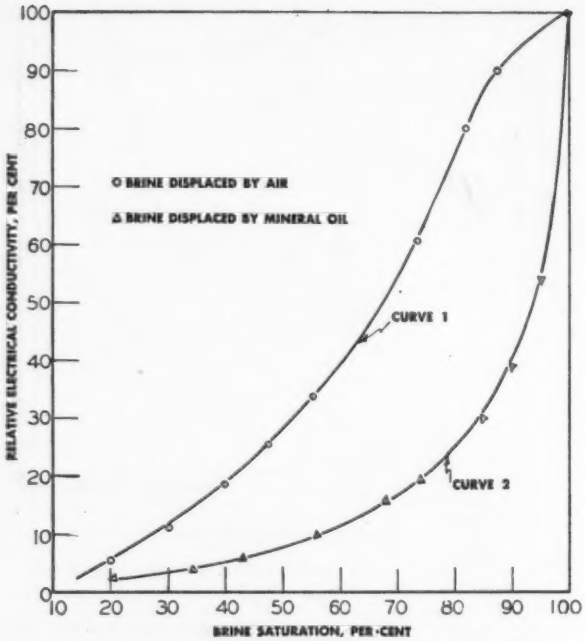
RELATIVE ELECTRICAL CONDUCTIVITY, PER CENT
BRINE SATURATION, PER CENT
○ BRINE DISPLACED BY AIR
△ BRINE DISPLACED BY MINERAL OIL
CURVE 1
CURVE 2

Fig. 10—Relative electrical conductivity vs. brine saturation, Bradford core 27-BT

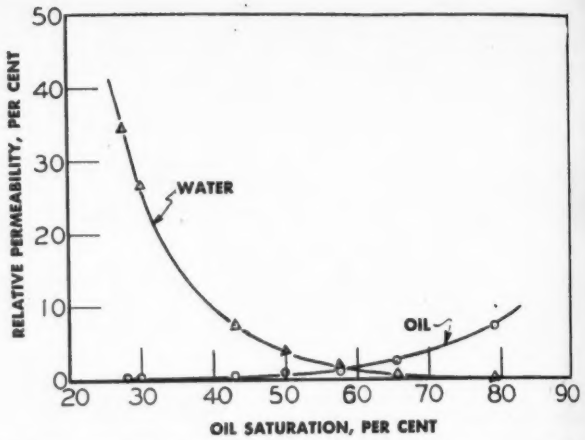

Fig. 11—Mineral oil-brine relative permeability, Bradford core 27-BT

through the clamping device by a strong spring. The construction of the clamp was such that the retaining pressure could be released instantly, and the sample core removed very rapidly for weight determinations.

Prior to starting any relative-permeability tests, the air permeability was determined on each sample. The weight of the cleaned and dried core sample encased in Lucite was measured accurately by means of an analytical balance. The core sample was then placed in a clamp with the mixing head and outlet assembly and the system tested for leaks by application of 80-psi. air pressure and immersing in a water bath. When the assembly was proved leak free it was evacuated from the outlet end until the pressure at the inlet end of the mixing head was less than three millimeters of mercury as determined by a vacuum gage at that point. With the vacuum pump still operating, a brine solution (0.25 normal sodium chloride) was forced into the mixing head and through the system at 85 psi. pressure. When the brine appeared at the outlet end, the vacuum pump was disengaged and several pore volumes of the brine flowed through. Immediately the core sample was removed from the system and weighed to determine the pore volume of the core.

After the pore volume or saturation was thus determined, the core was returned to the system, and the brine permeability measured. The core was then allowed to remain in the system with no flow for several hours, after which another determination of the brine permeability was made, the electrical conductivities of the fully saturated core measured, and the sample core weighed again. No change was observed in the brine permeability after this waiting period but the weight of the saturated core invariably increased from 40 to 50 mg. This increase in weight is due to the absorption of small amounts of water by the Lucite around the core, and so long as water remained in the core this absorption caused no further weight changes after a period of 5 to 6 hours.

Constant Delivery Rate

The core was remounted in the permeability apparatus, and flow of brine started by introduction of a slight air or oil flow. In all experiments brine was delivered from a Lucite container. The brine was displaced by mineral oil pumped by a small gear pump equipped with a variable-speed transmission driven by an electric motor. With this system a constant delivery rate could be maintained for long periods of time, and very wide variations in the delivered rate could be obtained very easily. When both oil and brine were used in the flowing system, the discharge of the pump was used to displace both the test oil and the brine, and the oil-brine ratio was controlled by needle valves in both injection lines. This arrangement was quite satisfactory, but independent pumps would provide positive control. Air for the experiments was delivered from a controlled pressure supply and the flow rate adjusted by means of a needle valve in the line very close to the point of injection in the mixing head.

After setting the rates of air and brine, or oil and brine, flow was continued until equilibrium conditions were reached. Attainment of equilibrium of flow was assumed when both the pressure drop across the test core, and the electrical conductivity of the core reached stable values. This equilibrium was reached, in all tests, after the passage of two to three pore volumes, or 5 to 10 cc. of total fluid through the core after changing the rates. Electrical conductivities were measured by applying a 60-cycle a.c. voltage between the electrodes on the mixing head and outlet assembly, and measuring, with an indicating electronic voltmeter, the voltage drop between the electrodes on the test core as compared with the voltage drop across a standard variable resistance box in the circuit.

When equilibrium of flow conditions was ascertained by the above-described observations, the produced fluids were collected in the proper measuring devices for a measured interval of time. Ordinary graduated cylinders were used for liquid collection and measurement, and a gas burette, or a wet test meter was used to determine produced gas volumes. Observations recorded were the pressure drop across the core, gage pressure at the downstream end, electrical conductivity under flowing conditions, volumes of fluids collected, and the length of time elapsed during the run. From these data, and the data from the liquid permeability tests when the core was fully brine saturated, calculations were made of the relative permeabilities to the various fluids.

At the end of each run of the oil-brine permeability tests, the core was withdrawn from the flowing system and weighed to determine the saturations in the core. From the conductivities measured simultaneously to these weight determinations, the brine saturation versus electrical conductivity relationship for each core was derived and plotted. It was planned that this relationship would be used to determine saturations during the subsequent oil-brine tests without with-

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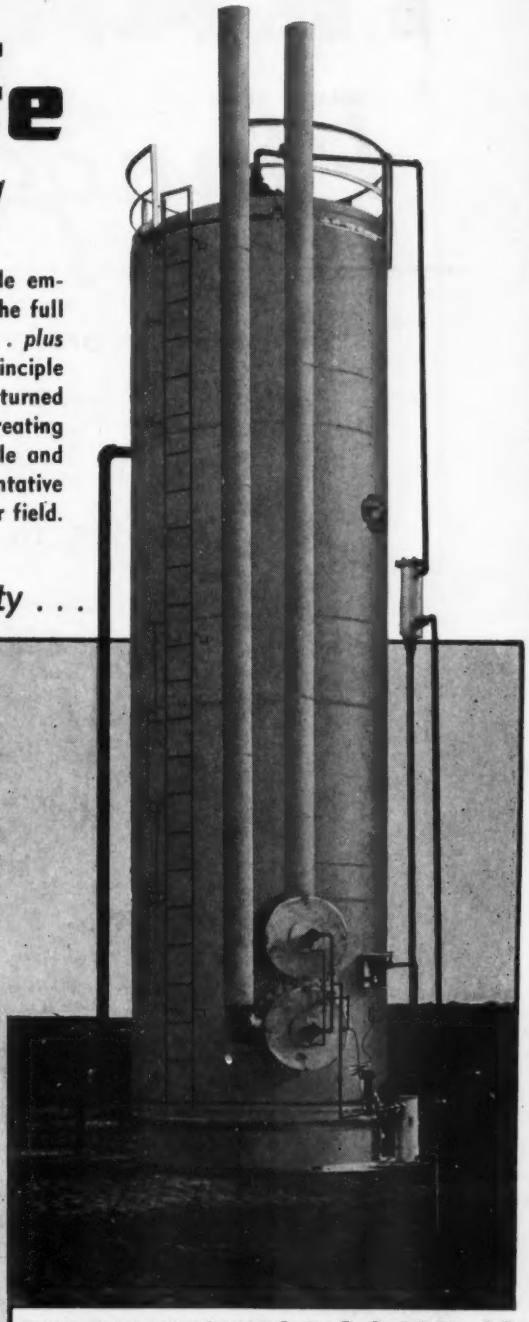

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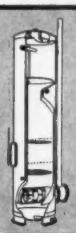

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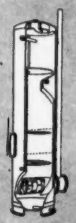

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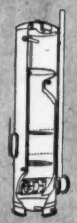

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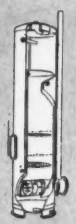

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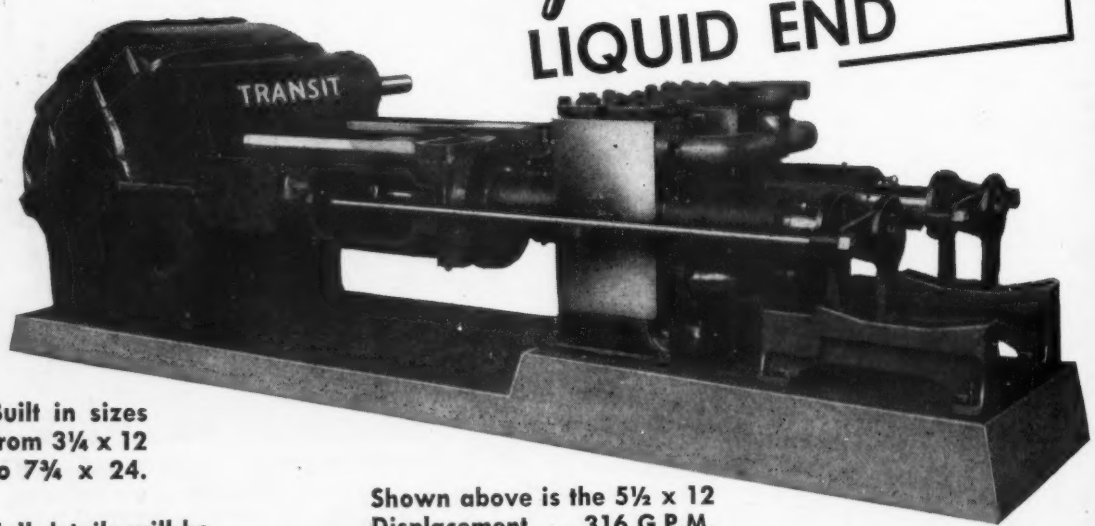

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drawing the core from the flowing system.

Several runs were made for the determination of each curve. The variations in saturation were produced by varying the fluid ratios in the flowing stream in a number of steps designed to cover the range of simultaneous flow in as complete detail as was considered necessary for accurate determination of the relationships sought.

During the development of the method outlined above, it was desired to check the validity of the results obtained by making the same determinations by another independent method. To allow this check, the preliminary apparatus was made up of a piece of synthetic sandstone, some of which was available in the form of a core about 10 in. long and 2 in. in diameter. The permeability of this sand was 4.2 darcies and the porosity 36 per cent. The long core was mounted in Lucite with electrodes and pressure taps at frequent intervals. A mixing head similar to that used for the small core studies was made for the large core, and relative-permeability determinations were made by use of this system. Pressure and electrical conductivities were measured along the entire core and it was found that the behavior near the outlet was very different from that of the rest of the core. Even at fairly high-pressure gradients, the water saturation could be seen to be higher toward the outlet end during the steady simultaneous flow conditions, and the pressure drop across the last section was from two to five times the pressure drop across sections of the same length located away from the end section. Obviously this end section must not be included in studies of relative permeability since behavior is very greatly influenced by the discontinuity in saturation at the outlet. This subject is treated in considerable detail in a thesis soon to be published by one of the authors.[7] In view of this anomalous behavior, a section in the center of the core was used for the determinations. It was felt that the data obtained, since it was free of boundary effects, would represent the best possible relative permeability measurements attainable.

Discussion of Data

Synthetic cores.—During the first attempt to run the relative permeabilities on the small synthetic sand core, the ends of the core and end assemblies were finished flat and a very thin neoprene gasket (about 0.002 in. thick) was inserted between the faces to provide a tight joint. Utilizing this system, the data of Fig. 2 were taken. Subsequent studies showed that the data taken by this method are very much in error. The separation of 0.002 in. between the cases of the assembly evidently was too much to allow saturation continuity throughout the part of the system used for measurement. This datum is shown to demonstrate the magnitude of error introduced by failure to eliminate boundary effects in the measuring system.

Shown in Fig. 3 is a graphical representation of the data obtained from the same core after the separating gaskets were eliminated and the system revised as described in the first part of the report. On the same figure are shown values determined from the tests run on the long core. The troublesome boundary effects noted in the first tests are apparently quite effectively eliminated by having the flat rock surfaces in absolute contact. The reproducibility of the relative permeability measurements is demonstrated adequately by the close check between the data taken by the two methods.

Fig. 4 represents the variation of relative electrical conductivity with changes of brine saturation. These data agree very well with similar results reported by Leverett[2,3] and Botset[4,5] in experiments with a considerable range of long unconsolidated sand columns and one long consolidated sand core.

Using the relative-conductivity versus brine-saturation relationship to determine saturation during the tests, a series of experiments to establish the oil-brine relative permeabilities for both the small core sample and the long core were run. The data for

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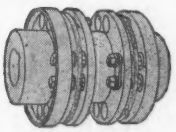
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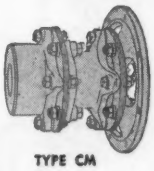
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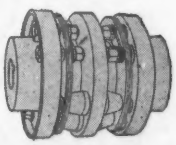
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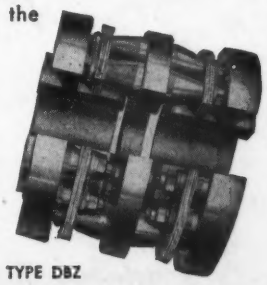
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these tests appear in graphical form in Fig. 5. The excellent check between the data from the long-core and the small-core measurements for both air-brine and oil-brine experiments was considered an adequate test of the validity of the results obtained by small core method as developed.

Second Venango sand tests.—Inasmuch as a considerable amount of experimental work has been done in Pennsylvania State College laboratories using long Second Venango sand cores, a plug from one of them was selected for relative permeability tests. The core selected had a porosity of 11 per cent, **air permeability** (measured at atmospheric pressure) 151 md., and 148 md. brine permeability.

The relative electrical conductivity-brine saturation relationship for this core is shown in Fig. 6, and the air-water and oil-water relative permeabilities in Figs. 7 and 8.

It will be noted that the permeabilities shown in both these figures are very different from those of the highly permeable synthetic sand. A small air saturation, in the air-brine tests, results in much sharper decreases in the brine permeability, and the point of equal relative permeabilities to each phase is at much lower air saturation than in the synthetic sand.

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During the oil-water permeability tests, the electrical conductivity-brine saturation curve of Fig. 6 was used to determine saturation. The use of this method was believed to be valid inasmuch as the published data of other workers had shown the relative electrical conductivity to be a function of brine saturation alone in a particular sand. Also the relative permeabilities and saturations shown checked very closely with those obtained from flood tests on a long core of the same sand in which saturations were determined by material balance methods. The minimum residual-oil saturation attainable after oil was introduced into the core was about **40 per cent.** The relative permeability to water at this point is only 4 per cent of the homogeneous fluid permeability even though the water saturation is **60 per cent.** This is in very close agreement with water permeabilities and ultimate oil saturations found on long core flood tests on all Second Venango sands utilized in this laboratory to date. Relative permeabilities to water after flooding the oil-and-water-saturated sands to depletion were always between 2 and 6 per cent. This behavior, as well as the general relative permeability relationship of the sand, shows it to be a definitely water-wet sand.

Bradford sand tests.—Fig. 9 represents the air-brine relative permeabilities for a sample of Bradford sand furnished by South Penn Oil Co. and designated as 27 BT. The **air permeability** was determined to be **93 md., brine permeability 83 md.,** and the porosity 20.2 per cent. Although the brine permeability was less than the air permeability, it must be noted that the air value was determined at atmospheric pressure.

The gas permeability corresponding to liquid permeability occurs only at very high pressure, and differences at other pressures are influenced by the magnitude of the permeability as well as other physical characteristics of the sand. It may be that clay swelling has effected some reduction in permeability but further checking will be necessary to determine the relative magnitude of the various contributing factors.

Along with the air-water relative permeability tests, the relative electrical conductivity versus water saturation relationship shown in Fig. 10 as Curve I was established. The core was then cleaned, dried, and resaturated with brine. After determining the brine permeability and the saturated weight of the core, simultaneous flow of oil and water was started. From the electrical conductivities it was noted that absurdly low water saturations were indicated at relatively high relative permeabilities to water. In view of these anomalous results it was thought advisable to check the saturation by weighing the core sample after each run. This series

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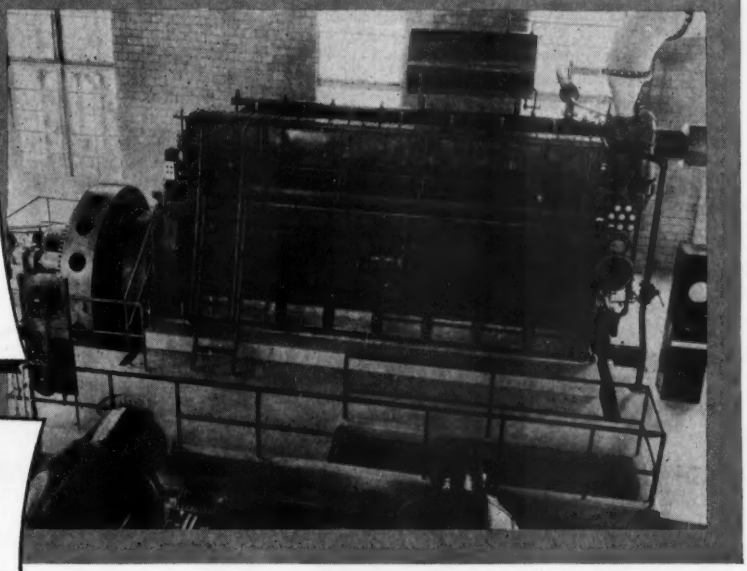

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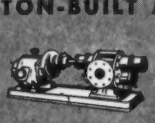

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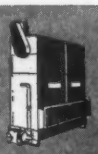

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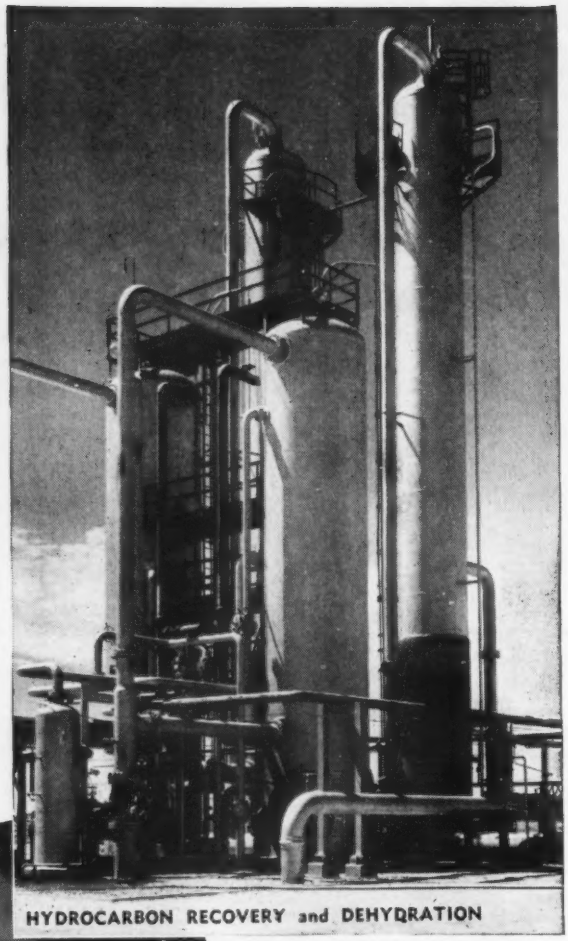

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of saturation determinations yielded the water saturation-relative electrical conductivity relationship shown in Curve 2 of Fig. 10. The relative permeability curves determined are shown in Fig. 11.

From the electrical-conductivity data of Fig. 10 it is readily apparent that there must be a very drastic change in the distribution of the brine from the condition where air was the displacing fluid to the use of oil as the displacing medium. The relative electrical conductivity at the same water saturation is in variance by as much as **350 per cent** under the two conditions.

The saturations as determined by weight differences would make a change in the direction indicated if a varying air or gas saturation were present in the core. However, if air or gas were in the core, it would expand when the flow was stopped, and force more liquid from the core, thus changing the electrical conductivity from that noted during the flow. Checks of both flowing and static conductivities showed **no** change so there was definitely no gas present in the core at any time.

Reference to the oil-water relative permeability curves of Fig. 11 show quite clearly the reason for this behavior. The sand was definitely performing as an **oil wet** sand during these tests as is indicated by the relative permeability of water at any particular water saturation being much higher than the permeability to oil at the same oil saturation. Even at an oil saturation of almost **80 per cent**, the relative permeability to oil is only **7 per cent.** In a water-wet sand the relative permeability to oil at this high oil saturation would be between 70 to 90 per cent. Even though the sand was essentially oil wet it was possible to reduce the oil saturation to 28 per cent by flowing water through. However, a large number of pore volumes of water throughput was necessary to attain this oil saturation.

Summary and Conclusions

A method has been developed and proven whereby two-phase relative permeabilities on a small core sample can be accurately determined under steady-state flow conditions. Not only were the data shown to be reproducible with this system, but comparison with independent determinations by an entirely different method proved the uniqueness of the relationship between saturations and relative permeability within a particular sand. It must be emphasized that the data shown cannot be interpreted as representative of the formation from which they were taken since not enough data has been collected to draw such conclusions. However, it has been shown that there are **very great differences** in flow behavior indicated between naturally occurring

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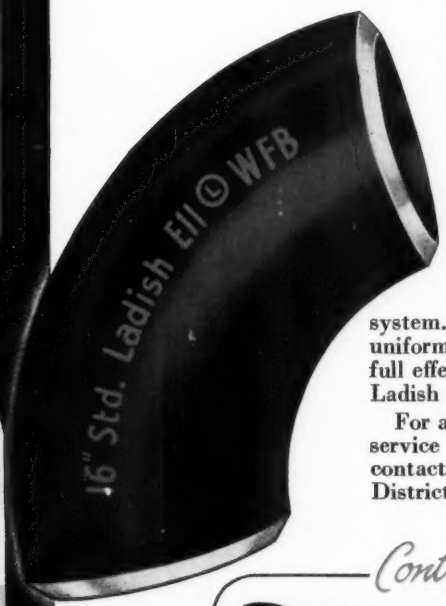

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sandstones. Further studies of this type should aid in understanding the production mechanism in both secondary and primary recovery processes which may result in a more efficient utilization of the driving medium.

Electrical conductivity of a particular sand has been shown to be a function, not only of brine saturation but also of the distribution of the brine in the pores of the rocks. From this it is obvious that electrical conductivity-brine saturation curves are applicable only under the same conditions prevailing during calibration.

Unless the flow system is so constructed as to eliminate saturation discontinuities at the boundaries of the test core, very great errors are introduced into determinations of relative permeabilities from two phase flow experiments.

Acknowledgment

This work represents a portion of the research program on secondary recovery of petroleum sponsored by South Penn Oil Co. of Bradford, Pa., in the division of petroleum and natural-gas engineering at Pennsylvania State College. The encouragement and aid of the engineers of the South Penn organization in this work is gratefully acknowledged.

Also, the authors wish to acknowledge the valuable suggestions offered by their associates of the college staff, especially S. J. Pirson and R. F. Nielsen.

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Seeking Arctic Oil

(Continued from page 81)

rected from Fairbanks where the Navy, Arctic Contractors, Wien-Alaskan Airlines, and the U.S.G.S. have headquarters. The U.S.G.S. facilities at Fairbanks include core testing, paleontologic and microlithologic studies, and map making. Additional facilities are available at the Washington U.S.G.S. headquarters so that the reserve exploratory efforts can be said to have complete geological support.

As geological and geophysical surveys are completed reports are made to the operating committee and bulletins have been made available covering specific areas or phases of the reconnaissance and exploratory work. (See bibliography at the conclusion of this article.)

As studies are completed the geological interpretation of the reserve, particularly from standpoint of its oil-bearing possibilities, changes, and these developments are reflected in the exploratory program. Without attempting to analyze the several reports that have been completed on regional geology, the writer feels that the following, taken from a report presented at the April meeting of the operating committee, gives a comprehensive and summary report of the stratigraphic and structural information covering northern Alaska based on information up to that time. The report stated in part:

Four Main Provinces

"Northern Alaska may be subdivided on the basis of stratigraphy, structure, and physiography into four main provinces, from south to north, as follows:

"1. The Brooks Range or mountain province of resistant Paleozoic rocks, deformed mostly by large-scale northward thrusting.

"2. The foothills province north of

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the Brooks Range, a belt about 40 miles in width, comprising weaker Triassic and Lower Cretaceous rocks deformed by complex folding as well as by northward thrusting. This province was probably the site of an east-west trending marine Lower Cretaceous geosyncline. Lower Cretaceous rocks are of great thickness and are predominantly dark shales and dark muddy sands (graywackes), very unfavorable from the viewpoint of porosity and permeability. The complex structure and graywacke character of the sands make this province unsuitable for oil exploration.

"3. The Arctic Plateau province, north of the foothills province, is a folded belt of Appalachian-type structures having anastomosing surface pattern. A few high-angle thrust faults of considerable displacement are indicated. Upper Cretaceous rocks are the only rocks that could be hoped to be penetrated by drilling in this province, which was the site of an east-west trending Upper Cretaceous geosyncline lying north of the Lower Cretaceous trough. Umiat probably lies in but near the northern margin of the geosyncline. Upper Cretaceous geosynclinal sedimentation was of deltaic type with indicated progressive northward overlap of terrestrial over marine facies during Upper Cretaceous time. In general, the sands are argillaceous and unfavorable in porosity and permeability; locally, however, relatively clean sands exist along certain belts probably representing temporary halts of strand line movements that allowed sufficient time for winnowing of the mud from the sands in bars, beaches, and dunes. These cleaner sands probably are in the form of lenses (shoestrings) within larger sand-shale units. The lenses may be persistent east-west along the strike. They seem to be associated with coals deposited in coastal marshes.

"4. The Arctic coastal plain province, in contrast with the geosynclinal belt, is believed to be more of a structural "platform" area of probable gentle basins and arches and Midcontinent-type structures. Such great thicknesses of sediments as occur in the Cretaceous geosynclinal belts cannot be expected, by analogy with other regions, to extend very far northward. A guess as to the thickness of the Upper Cretaceous at Simpson is that it is in the order of 3,000

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ft. If the break indicated by the seismograph at a depth of about 7,000 ft. at Simpson represents a sharp angular unconformity, as apparently it is interpreted by Legge, it is regarded as most likely that the break is of mid-Paleozoic age. Reasons for this inference are as follows:

"(a) Elsewhere in Alaska there is evidence of a profound orogeny at the end of Silurian time that deformed, metamorphosed, and intruded the early Paleozoic sediments.

"(b) There is no evidence in adjacent regions of Alaska of an orogeny during later Paleozoic time, at the end of the era, or during Triassic or Jurassic time.

"(c) Although there is evidence of an orogeny in mid-Cretaceous time south of the Brooks Range, there is no outcrop evidence that this pre-Upper Cretaceous folding extended far north of the Brooks Range area; conformable structure in the Umiat area to a depth of over 14,000 ft. indicated by the seismograph argues against a mid-Cretaceous angular unconformity. If rocks below the deep break at Simpson are of early Paleozoic age, they may be regarded as "basement" and as sloping southward. The magnetic "highs" may represent intrusions within this basement and may have little effect on surface structures, as seems to be indicated. Within the northern part of the reserve there are possibilities of convergence, overlap and wedge conditions within the Late Paleozoic and Mesozoic section. Uniform and continuous sedimentation over the whole area throughout this great span of time could hardly be expected. Local conditions of uplift, truncation, and overlap are likely. This should be considered in planning geophysical work. Within the Upper Cretaceous of the coastal plain province the beds are believed, on the basis of what little outcrop evidence is available, to be more persistent and more of 'blanket' character, in contrast with the lenticularity and rapid wedging of the deltaic section within the geosyncline to the south. Webber in his work down the Meade River and along the coast found, in the lower and middle parts of the Upper Cretaceous, recurrent beds of sublithographic limestone in close association with coal and ironstone, very reminiscent of the Pennsylvanian cyclothems of Ohio and Indiana where there is great lateral persistence of these units. He found the sands to be much more uniform in grain size than in the geosyncline to the south. Along the coast in the vicinity of Skull Cliff, he found a sand unit to be very persistent and uniform laterally. It is believed that sands in the coastal plain province will, in the aggregate, be cleaner than sands in and south of the Umiat area."

For base-map information the reserve has trimetrogon-aeronautical charts developed from information obtained by the Army which flew the area in 1943. The reserve was reflown by the Army in 1945 at 12,000 ft. The geological department has 1-48,000 planemetric maps and quadrangle index maps. These are used in platting geological information.

At present there are four parties working in the reserve. These parties are:

1. Along Colville River from Umiat to Arctic coast. Four men with small boats.

2. Along Kigalik River anticline and Awana River anticline. This is a structural study to determine closure. Four men.

3. Two hundred miles west of Umiat. Down Utukok River to Arctic coast. Unfavorable aerial surveys were made of this area. The main objective is to find beds having porosity. Five men with small boats.

4. Airborne party working isolated exposures in south part of reserve. Two men.

5. One hundred and twenty-five miles northeast of Umiat in the Shaviovik and Canning River areas. Area outside reserve supported by U.S.G.S. funds.

The first work of the parties is decided upon in November. Transportation, supplies, and camping equipment have to be at location by April 1. Aerial photographs are studied to determine the location of food caches. Iron cases for protection from bears

ANNOUNCEMENT

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is necessary in some cases. The "10 in 1" Army ration is used for part of the food supply of the summer parties.

Two of the river parties use collapsible boats with one boat for two men. Other parties use Army weasels (light amphibious tractor) for transportation over land and small bodies of water. These weasels require large quantities of gasoline as they use 1 gal. per 3 miles. In some cases it has been necessary to drop gasoline drums by the use of parachutes. The parties are taken to location not later than May 15 in airplane equipped with skis.

All parties are equipped with radio telephones. The two-way 2½-watt radio telephone is used with dry batteries and a 3,385 frequency. Each night the Umiat headquarters get in touch with these parties. These telephone contacts permit the party chiefs to make whatever reports are necessary. The parties obtain supplementary supplies and mail delivered by airplane. The season for the geological parties ends September 1.

Geophysical

The first geophysical party in the reserve started work in May 1945, being employed by the Navy. The work is now being done by United Geophysical Co. under subcontract with Arctic Contractors. J. A. Legge, Jr., is in charge for the United company.

This season two seismograph parties are operating. Both parties are located in the Ikpikpuk area about 100 miles northwest of Umiat and south of Point Barrow as shown on the map. Each party, consisting of 24 men including one U.S.G.S. geologist, is a complete unit. As previously explained all the principal equipment and most of the supplies have to be moved to locations during the early part of the year by tractor trains over ice and snow. The first shooting starts in late March and this year the parties expect to continue operations until mid-October.

The basic equipment consists of four RD-8 tractors and eight weasels for transportation, a number of wanigans, and drilling equipment for each party. All wanigans are mounted on sleds. Four wanigans are required to supply water, and five are used for sleeping quarters. Other wanigans house office and drafting tables, radio equipment, galley, mess hall, utility building, shower, storage, and shop for mechanic. The weasels are used by party chief, surveyor, shooter, mechanic, driller, and other members of the party for all transportation over the tundra and water bodies. The seismograph instruments are mounted on a weasel-enclosed hull which is pulled by another weasel. A reel weasel is used to pick up and lay the cable.

The drilling equipment consisting of Mayhew-1,000 units is mounted on pipe sleds and completely housed. These units were surplus war equipment, having been used in the South Pacific to drill water holes. The depth of the holes varies from 60 to 100 ft. Getting equipment to the desired location for shooting, because of terrain conditions, is the most difficult problem in seismograph work.

Supplementary supplies and personnel are brought to the parties with small airplanes three to four times weekly. These planes use pontoons for water landings during the summer months and skis during the period in which the tundra and water bodies are frozen. The planes provide a mail service.

Radio Contacts

The seismograph parties are contacted twice daily (morning and evening) by radio telephones from the Point Barrow headquarters. The Barrow headquarters is equipped with a 400-watt master station and the parties have 50-watt units. The station operates on 2,810 kilocycles.

Airborne Gravimeter

United Geophysical Co. is securing satisfactory reconnaissance results with the use of airborne gravimeter service operating in the north end of the reserve. A Cessna 140 airplane equipped with skis and pontoons is

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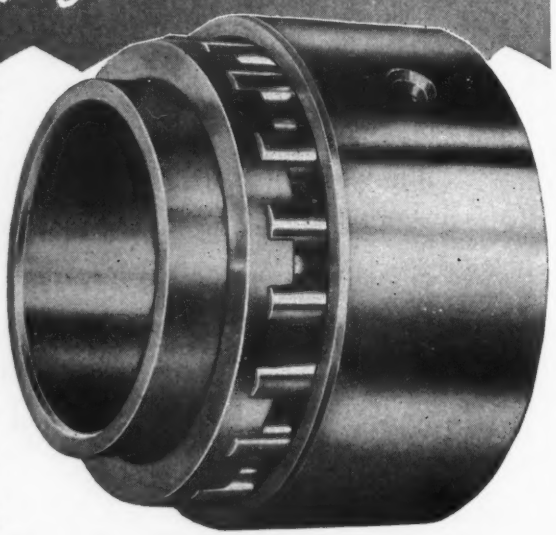

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used to transport the equipment and three men including pilot.

Locations for this work are determined by the use of aerial maps. The gravimeter is taken from the plane after landings are made. The party chief acts as computer. From 20 to 30 landings are made daily with this equipment which supplements ground gravimeter operations.

Airborne Magnetometer

Airborne magnetometer surveys were made in 1945 and 1946 as a joint venture of the Navy and the U. S. Geological Survey. An area of approximately 70,000 sq. miles was covered in this work from the Canning River to the west coast of Arctic Alaska. The reconnaissance information obtained is used in connection with the more detailed exploratory work now under way.

Coring

Core testing is completed during the winter and spring months before the streams and tundra thaw. These tests are drilled with Failing equipment mounted on sleds with all facilities enclosed.

In November and December last year the 1 Umiat core test was drilled to a depth of 572 ft. The test has produced crude oil for testing purposes at a depth of 300 ft. It is believed that this formation will show a production of around 50 bbl. daily in a regularly drilled test.

Other core tests drilled so far this year as part of the exploratory program are: 1 Sentinel Hill, 1,180 ft.; 1 Skull Cliff, 779 ft., and 1 Barrow, 1,442 ft.

Two wildcat tests were spudded in June. The 1 Simpson is located at Cape Simpson and 2 Umiat is near the Umiat camp. In the Umiat area the first wildcat test of the reserve was abandoned at 6,005 ft. last year. The two tests are now drilling at shallow depths.

Airplane Support

Bush flying is an integral part of the search for oil in northern Alaska. Without the various types of airplane services it is doubtful that an effort would have been made at this time to determine the oil potentialities of Naval Petroleum Reserve No. 4. Dependency on land and water transportation would have meant that exploration would be extended over a long period and costly and it would not have been possible to utilize some of the exploratory services of the past 3 years.

Activity in the reserve largely revolves around weather conditions and these operating requirements in turn determine the flying schedule of the bush pilots. The schedule of Wien Airlines, operating under contract with Arctic Contractors, as outlined at the start of the 1947 season is shown in the accompanying chart. This does not include the regular "line haul" schedule of Wien Airlines from Fairbanks to Umiat and Point Barrow in which DC-3 planes are used for personnel and freight.

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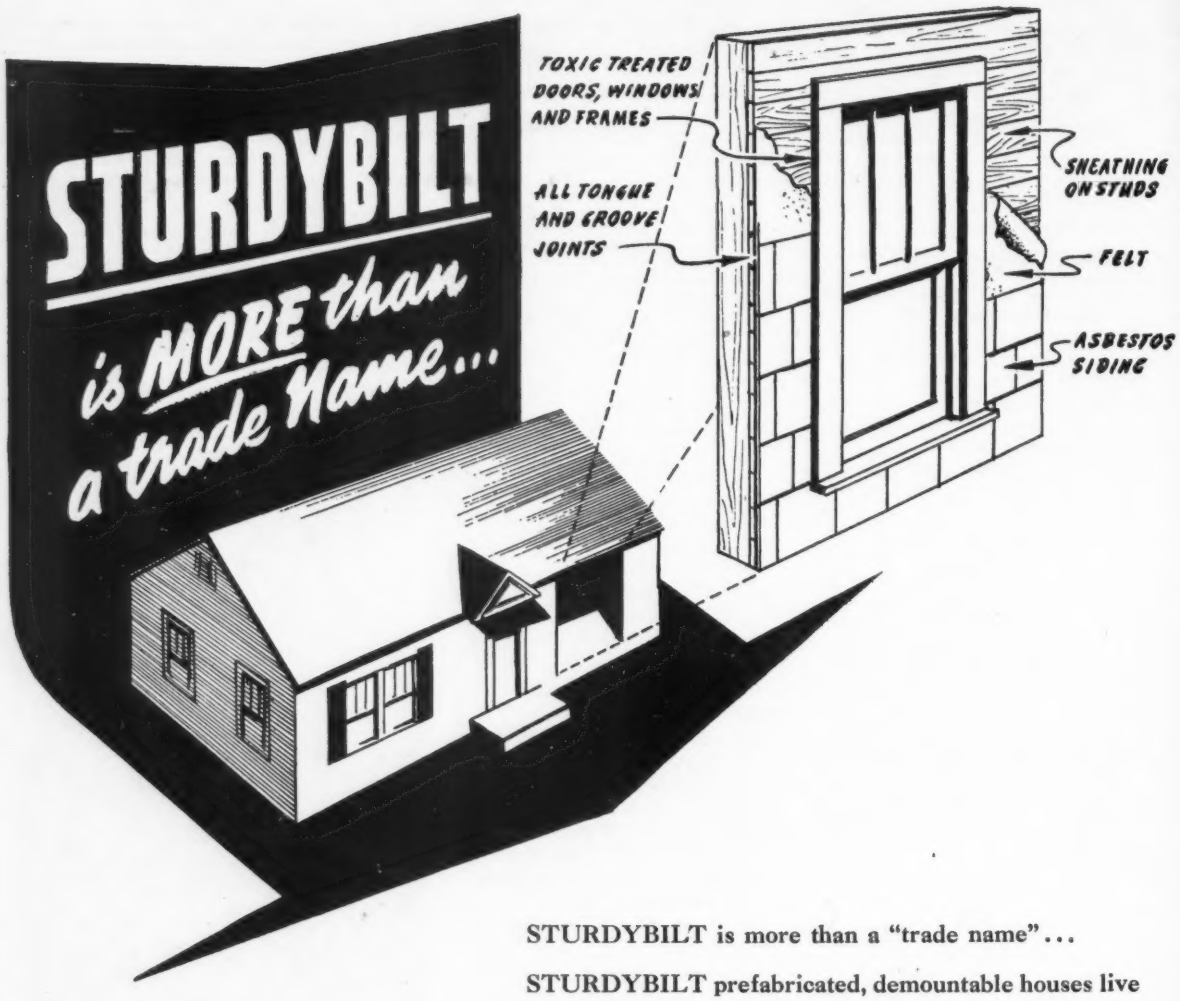

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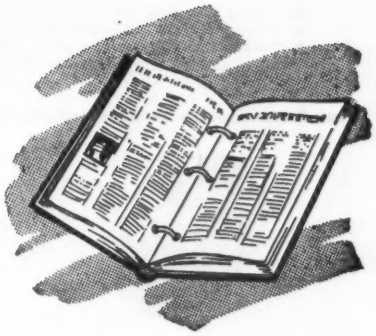
The Refiner's Notebook

A WEEKLY FEATURE OF THE OIL AND GAS JOURNAL



Refinery Pump Service

TENTATIVE SCHEDULE OF TOPICS

No. 154, July 28—Pump Selection
No. 155, Aug. 9—Suction Lift of Pumps
No. 156, Aug. 16—Priming Centrifugal Pumps
No. 157, Aug. 23—Propane
No. 158, Aug. 30—Refinery Pump Services
No. 159, Sept. 6—Vacuum Pump and Close Clearance
No. 160, Sept. 13—Shaft Alignment
No. 161, Sept. 20—Lime Soda Water Treating
No. 162, Sept. 27—Pump Operation

ALL three types of pumps, reciprocating, centrifugal, and rotary, are employed in refineries. Some of their characteristics have been indicated in The Refiner's Notebook No. 153 (July 19, 1947) entitled, "Capacity-Head Relationships of Pumps," and in Notebook No. 154 (July 28, 1947) entitled, "Pump Selection." Here specific applications will be enumerated. Little will be said of steam-driven reciprocating pumps because their behavior is well known. Their primary advantages are (1) a wide range of capacity, (2) ability to handle volatile or viscous liquids, and (3) a construction that allows extremely high pressures.

Asphalt or semisolids.—Reciprocating steam pumps are widely used because they can, up to their limit, develop full pressure and thus sometimes dislodge even solid material from the line. Rotary pumps (sometimes steam jacketed) are also used. Standby reciprocating "ram" pumps are often used to open up plugged residuum or asphalt lines.

Boiler feed.—Centrifugal pumps are increasingly useful because of the smooth flow of liquid, ease of automatic regulation, their simplicity, and small space required.

Burners.—The "blowing" or "puffing" of burners is avoided by the use of rotary pumps for circulating the fuel oil.

Cargo loading.—For nonviscous fluids, centrifugal pumps are widely used because of their inherent high-capacity low-head behavior. Only a few hours are now required to load a vessel. Rotary pumps are used for more viscous materials.

Circulating.—Centrifugal pumps are excellent for low-head-capacity circulation systems such as those encountered in blending ethyl fluid into gasoline or in treating plants. Reciprocating and rotary pumps are used for asphalt blending or mixing.

Chemical feeds.—Rotary pumps are widely used but very small plunger pumps synchronized with the main charge pump are also used because they proportion the feed of chemical.

Cold general service.—Spray-pond water, cooling-box water, cold-oil charge stocks, reflux, etc., can be handled nicely with centrifugals. An important consideration is the fact that they can be repacked while in service. Obviously, hot-oil pumps must be shut down to repack them. Centrifugals are safer than positive-displacement pumps because the discharge valve can be closed without bursting valve boxes, blowing gaskets, etc. The use of steam turbines as drivers permits sufficient regulation of capacity for most services.

Cracking-coil charge.—Multistage centrifugal pumps have rapidly displaced reciprocating pumps. This service is characterized by a high temperature, high pressure, and low capacity. They are relatively low in cost, the space required for them is small, foundations are relatively light, and they produce a smooth nonpulsating flow that simplifies the maintenance of instruments, valves, lines, and fittings. The stuffing boxes are water cooled and steam snuffer connections lead to each box.

Fire pumps.—Two centrifugals with a common prime mover are used almost exclusively for foam smothering. Only a small space is required, foundations are light, they fill the empty line quickly, leaks in the little-used lines are fewer because of the smooth nonpulsating flow, and they can be built cheaply of cast iron which is flushed out with water as soon as the acid has been delivered.

Fuller's earth, clay, etc.—Slurries of these materials are handled by centrifugal pumps by feeding gas oil or light neutral oil to the stuffing boxes. However, for the very worst combination of temperature and abrasion, reciprocating pumps or cheap rotary pumps are employed and the worn parts are replaced at frequent intervals.

Gasoline.—Dispensing pumps at filling stations are mainly rotary pumps. Volatile fluids can be handled by centrifugals particularly submerged types, the largest lifts are obtained with close-clearance reciprocating pumps.

High pressure.—The reciprocating or ram pump is standard for extreme pressure, although small rotary pumps up to 2,500 psi. are used for some services, and multistage centrifugals are occasionally used up to 1,000 psi.

Loading racks and bulk stations. Centrifugal pumps are useful because the discharge line can be transferred from one point to another by simply closing the discharge valve. Remote push-button controls can be employed. "In line" centrifugal pumps are useful because they avoid loops and bends and are free from vibration.

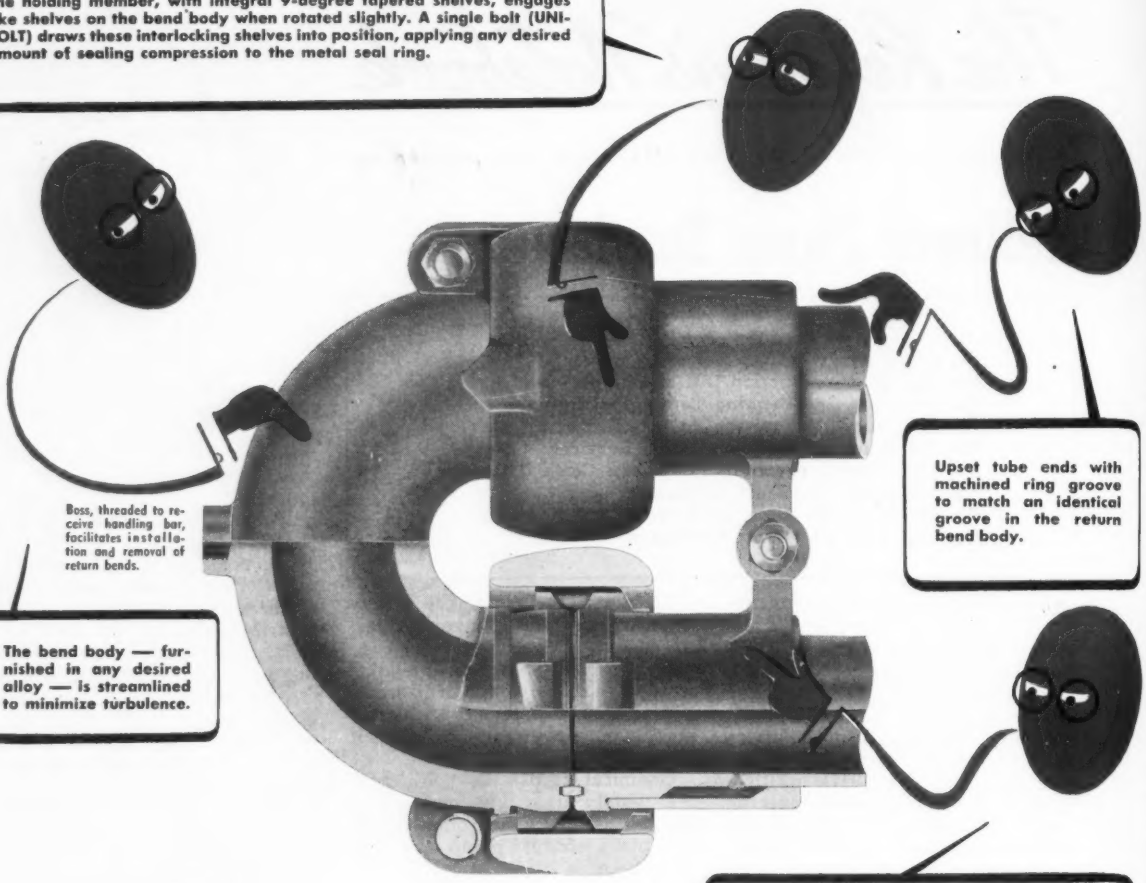
Viscous oils.—Reciprocating and rotary pumps are used for asphalts, but centrifugal pumps can be used for medium-viscosity oils particularly if capacity is large.

Water.—Centrifugals are almost standard practice. They are inexpensive, have few wearing parts, and the foundations are light.

Vacuum.—Submerged self-priming centrifugal pumps are used but many reciprocating and submerged rotary pumps are in service.

No. 158 in a series by W. L. Nelson, professor of petroleum refinery engineering, University of Tulsa

The holding member, with integral 9-degree tapered shelves, engages like shelves on the bend body when rotated slightly. A single bolt (UNIBOLT) draws these interlocking shelves into position, applying any desired amount of sealing compression to the metal seal ring.



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MODERN Rotary DRILLING

Power Requirements

WITH discussion of the hoisting and rotating system of the rig completed this installment starts consideration of the power system of a modern rotary rig. Before going into details of this system, a few general thoughts should be presented. Rotary-rig power requirements include power needed for hoisting, for rotating, for circulating the drilling fluid, and for operation of auxiliaries.

Hoisting.—Apart from purely mechanical considerations the question of providing the hoist with sufficient power is also an economic problem.[1] For any given set of conditions of maximum depth and size of the pipe used there is, of course, a certain lower limit of power requirements. Reducing the available power below this limit results in reduction of operating efficiency, particularly in areas where drilling conditions require frequent round trips. There is also an upper limit of hoisting power needs and increasing the power above this limit results in an unprofitable excess investment. While it is true that the round-trip time should be reduced to a minimum, if efficiency is to be maintained, it must be remembered that increasing the hoisting horsepower reduces only the time of actual lifting of the pipe. This time is only a relatively small portion of the total round-trip time. For any given set of conditions, therefore, increase of power beyond certain limit, results in rapidly diminishing returns.

Assuming that the speed ratios within the hoist are such that the capacity of the engine can be satisfactorily utilized, the theoretical hoisting-power requirements may be calculated from the formula defining the horsepower. In Fig. 34, a chart is presented worked out from this formula for following specific assumptions: (1) starting "off bottom" speed 100 ft. per minute, (2) hook-to-engine efficiency 70 per cent, (this is efficiency generally assumed for power rigs, with steam rig efficiency slightly higher), and (3) pipe friction offset by buoyancy effect.

If the above assumptions apply, the chart may be used to determine either the power required for any given depth and size of pipe or the depths to which different sizes of pipe may be used for any given available hoisting power.

Rotating.—The range of power requirements for the drive of the rotary table is very wide (Installment 32). This is particularly true in view of the practice, quite common in certain areas, of using high rotating speds. Tests conducted a number of years ago indicate that the power requirements of the rotary table increase rapidly with increase of speed of rotation.[2]

More recent tests, conducted by the engineers of a major operator, led them to adaption of a certain rule-of-the-thumb formula which was found to be satifsactory in practical application. According to this formula, for a conventional rotary drive through the draw works and for speeds up to 300 r.p.m. the maximum engine-power requirement of the rotary table equals about 1 hp. for each revolution per minute of the table. In other words, if the amount of horsepower is provided equaling the maximum amount of r.p.m. at which the table is expected to be run, no difficulties are experienced due to lack of power for the table.

Circulating.—Power required for pumping is a function of the volume of fluid handled and of the head on the pump and is calculated from the formula:

$$HP = \frac{V \times P}{1{,}715 \times E}$$

where:

HP = power to pump, horsepower
V = volume of fluid handled g.p.m.
P = head on pump, psi.
E = pump efficiency

It is apparent from this formula that the conditions of deep-well drilling make the pumping-power requirements of a modern rotary rig very large. Circulation of the drilling fluid is also the most sustained major function of the rig. As a result from 70 to 85 per cent of total horsepower hours needed for drilling of a well are utilized in circulation of the drilling fluid.[3]

Pumping-power requirements will be discussed in more detail later in this series in installments dealing with the circulating system of the rig. For the time being it is sufficient to state only that no relationship may be established between the power requirements for circulation of the drilling fluid and the drilling depths.

Auxiliaries.—In the case of a light rotary rig of the past, power needed for operation of rig auxiliaries was a relatively small item. This situation has now changed. New auxiliaries have been added and the size of those used with the rig in the recent past has been greatly increased.

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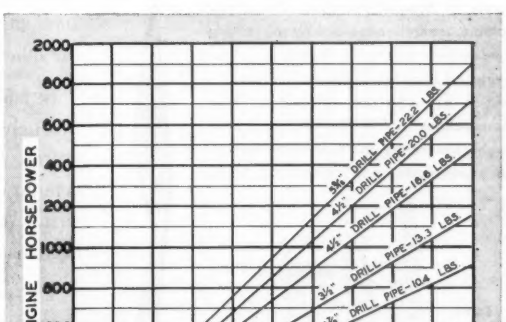

Fig. 34—Hoisting-power requirements (assuming 100 ft. per minute off bottom speed, 70 per cent hook-to-engine efficiency, pipe friction offset by buoyancy)

No. 34 in a series by Joseph Zaba, petroleum engineer, Houston

Elk Hill Drillers Reduce Water Loss and Costs...

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ENGINEERING *fundamentals*

Relationship Between pH and Hydrogen Ion Concentration

IN order to provide a scale that could be used easily and conveniently for indicating the hydrogen ion concentration, S. P. L. Sorenson, a Danish chemist, devised the present pH scale in which pH is the negative logarithm of the hydrogen ion concentration. In other words, pH is defined as equal to log where H is hydrogen ion concentration.

If 1 g. of hydrogen ions is present in each liter of solution, it has a pH of 0; if 0.1 g. per liter is present, it has a pH of 1, etc.

The following table shows this relationship:

Quantity of hydrogen ions present, grams per liter	pH value of this solution
1.0	0
0.1	1
0.01	2
0.001	3
0.0001	4
0.00001	5
0.000001	6
0.0000001	7
0.00000001	8
0.000000001	9
0.0000000001	10
0.00000000001	11
0.000000000001	12
0.0000000000001	13
0.00000000000001	14

The above table shows the relationship between pH and hydrogen ion concentration. It will be seen that the acid solutions have the lower pH values and as the pH increases toward 7 a neutral solution is encountered. As the pH continues to increase beyond 7, an alkaline condition appears. Pure water, as previously mentioned, at 22° C. has a pH of 7. Careful note should be taken of the fact that the relation between pH and the hydrogen ion is not a linear one. Thus, when the pH of a solution changes in value from 4 to 2, the hydrogen ion concentration increases from 0.0001 g. per liter to 0.01 g. per liter, an increase of 100 fold. This fact will again be considered when we discuss automatic pH control.

The following table indicates the pH values of various acids and alkaline materials in aqueous solutions:

Acids	pH
Hydrochloric acid	1.
Sulfuric acid	1.2
Phosphoric acid	1.5
Sulfurous acid	1.5
Acetic acid	2.9
Alum	3.2
Carbonic	3.8
Boric acid	5.2
Bases	**pH**
Sodium bicarbonate	8.4
Borax	9.2
Ammonia	11.1
Sodium carbonate	11.6
Trisodium phosphate	12
Lime	12.3
Sodium hydroxide	13

The solutions are of the same total concentration, and if they were equally and completely dissociated, the acids would all yield the same quantity of hydrogen ions and the bases would all yield the same quantity of hydroxyl ions. The ability of an acid or base to dissociate must be carefully considered when selecting reagents for automatic pH control.

Thus far we have assumed that when a given quantity of a given acid such as sulfuric is dissolved, the resulting hydrogen ion concentration or pH value will always be the same. Unfortunately this is not the case. If the solvent in which it is dissolved is only slightly buffered, one pH value will result, while on the other hand, if the solvent is well buffered, another pH value will result. For example, a very small quantity of a very weak sulfuric acid added to pure unbuffered water changes the pH from 7 to 5. Whereas, if the water contains salts or other substances whose products of dissociation offer resistance to the dissociation of the acid, the resulting pH change will be less than with the unbuffered solution.

Buffer Action

The tendency of substances in solution to resist possible changes in pH value is termed buffer action. Solutions may be totally unbuffered, weakly buffered, or very strongly buffered, and careful consideration must be given to the buffer action in applying automatic pH control. In addition, the ability of a buffer to resist changes in pH is not a straight-line function and once the resistance has been overcome, the pH will change almost proportionately to an unbuffered solution. From this it becomes obvious that in an automatic control process a change in buffer index would greatly affect the quantity of a reagent required to maintain a constant pH.

It is not the purpose here to discuss completely the chemical methanism which causes the above effects. Suffice it to say that the action occurs and must be taken into account. To determine the buffer action of a solution, one need only dilute a sample of the given solution with pure distilled water. When the buffer action has been overcome, a marked change in pH value will occur. The quantity of water added will thus indicate the relative buffer action.

Contributed by Southern California Meter Association. Author: N. E. Swanson, Los Angeles, The Foxboro Co.

NATURAL GAS

State Sues to Prevent Sale of Gas Properties

A SUIT to prevent the sales of natural-gas properties of Oklahoma Power & Water Co. to Oklahoma Natural Gas Co. has been filed in Tulsa district court by Mac Q. Williamson, Oklahoma attorney general.

Gov. Roy J. Turner requested the action, declaring Oklahoma statutes forbid the sale of facilities of one company to a company engaged in competitive public service.

Sale of the properties, located in Osage, Tulsa, and Pawnee counties, Oklahoma, was approved little more than a week ago by the Securities and Exchange Commission. In asking SEC for authorization for the sale, Oklahoma Power & Water officials said it was being conducted solely to meet requirements of the Federal Holding Company Act, which forbids private utilities to engage in incidental business operations.

The petition to enjoin O.P.W. from consummating the sale declares the transaction would violate portions of the state constitution governing the sale, purchase, and consolidation of competing corporations. It charged that some of the properties involved should be classified as parallel and competing with those operated by O.N.G.

In an answer to the petition, O.N.G. said the companies have been separately engaged in the production and selling of natural gas, but denied that the properties in question have been competing or parallel gas lines.

The properties include gas transmission and distribution lines, oil and gas leases, and production and other properties.

Hearing Set on Plans Of Kansas-Nebraska

A hearing on an application of Kansas - Nebraska Natural Gas Co., Inc., to construct additional gas facilities will be conducted by the Federal Power Commission August 26.

Proposed facilities, to cost an estimated $462,500, include construction of a new 250-hp. compressor station and the addition of an aggregate of 4,200 hp. in existing compressor stations. The company operates in Kansas and Nebraska.

The commission was scheduled this week to conduct a hearing on an application of Cities Service Gas Co. for authority to buy and operate facilities owned by Interstate Gas Co. The facilities, consisting of pipe lines in Missouri, are valued at $98,400.

East Ohio Asks Authority To Build 20-In. Pipe Line

Application for authority to construct about 84 miles of 20-in. pipe line has been filed with the Federal Power Commission by East Ohio Gas Co.

The proposed line would extend from the company's Mullet Farm valve station in Monroe County, Ohio, to its Gross Farm valve station in Stark County and would carry additional Big Inch gas.

Cost of the project has been estimated at $3,200,000.

Panhandle Eastern Would Supply Western Michigan

A proposal has been made to Michigan Consolidated Gas Co. by Panhandle Eastern Pipe Line Co. to supply all natural-gas needs of the Michigan company both in Detroit and western Michigan, if it will drop plans to construct a 26-in. Texas-to-Michigan pipe line, a line that would be sold later to the Michigan-Wisconsin Pipe Line Co.

Panhandle Eastern made the proposal near the close of the Federal Power Commission hearing on Michigan Consolidated's application to build the pipe line. Attorneys for Michigan Consolidated have requested time to study the new proposal.

Engineering Foundation Backs Research Project

To aid in organizing data on the standard properties of gases and gas mixtures is the purpose of a new research project being sponsored by the Engineering Foundation, it was announced recently by Dr. A. B. Kinzel, chairman of the board.

Dr. John A. Goff of the American Society of Mechanical Engineers directs the experimental studies and computations now being made at the Thermodynamics Research Laboratory of the University of Pennsylvania.

The first phase calls for a systematic recalculation of zero-pressure properties from the best available spectroscopic data. The next step will be to determine the corresponding properties at finite pressures.

Westinghouse Seeks to Assure Supply of Gas

Westinghouse Electric Corp. is drilling an exploratory gas well near its copper mill on the grounds of its East Pittsburgh Works.

W. C. Rowland, factory service division manager, said the company is seeking to obtain a small emergency supply of natural gas as a standby in the event gas deliveries to industrial plants are curtailed this winter.

Lone Star Plans 10-In. Line

Lone Star Gas Co. is planning immediate construction of a 25-mile 10-in. line from its Caddo Stephens County main to the Roy H. King gas wells 5 miles north of Eliasville, in South Young County. The line, to cost an estimated $300,000, will connect with five wells with a total production of 90,000,000 cu. ft. a day.

Natural Gasoline

Keystone Pool Gasoline Plant Contract Awarded

Richardson & Bass, Fort Worth, have awarded a contract to Jones & Laughlin Supply Co., Tulsa, to design and construct a natural-gasoline plant in Keystone pool of Winkler County.

Phillips Petroleum Co. and Sinclair Prairie Oil Co. will be associated with Richardson & Bass in the Keystone plant which will be designed for an initial throughput of 55,000,000 cu. ft. of gas daily.

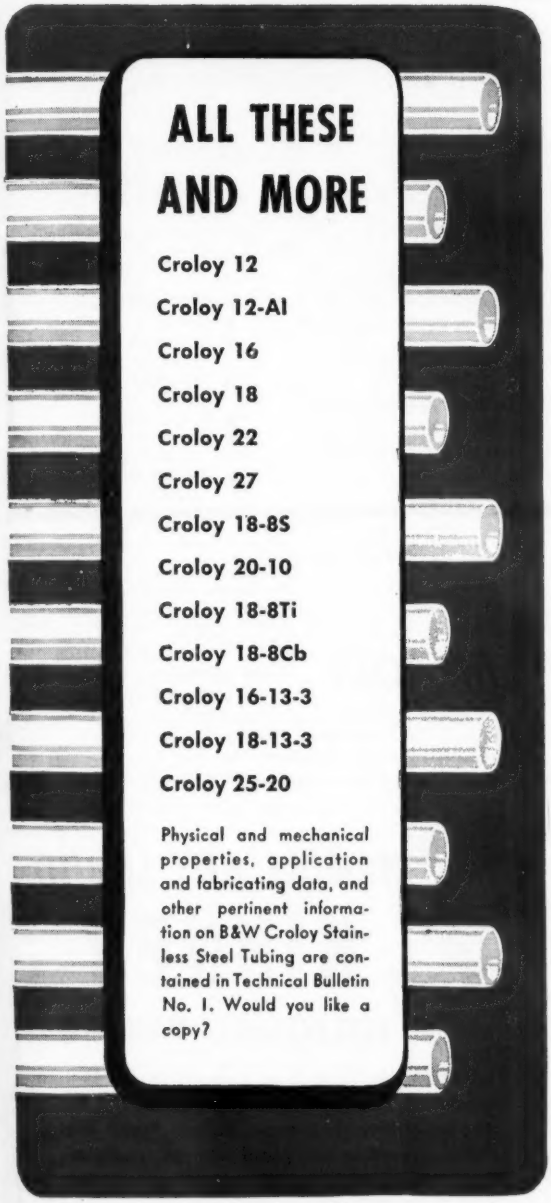
The plant will have two separate gas gathering systems. The initial liquid production has been estimated at 90,000 gal. daily, increasing later to a peak of around 175,000 gal.

Construction is not expected to get under way until the middle of 1948.

Phillips Shifts L.P.G. Unit

Phillips Petroleum Co. has announced the transfer of its L.P.G. marketing organization from the research and development department to the sales department. K. W. Rugh will continue in his capacity as manager with L. H. Wright as assistant manager of the Philgas division of the sales department.

STAINLESS STEEL TUBES



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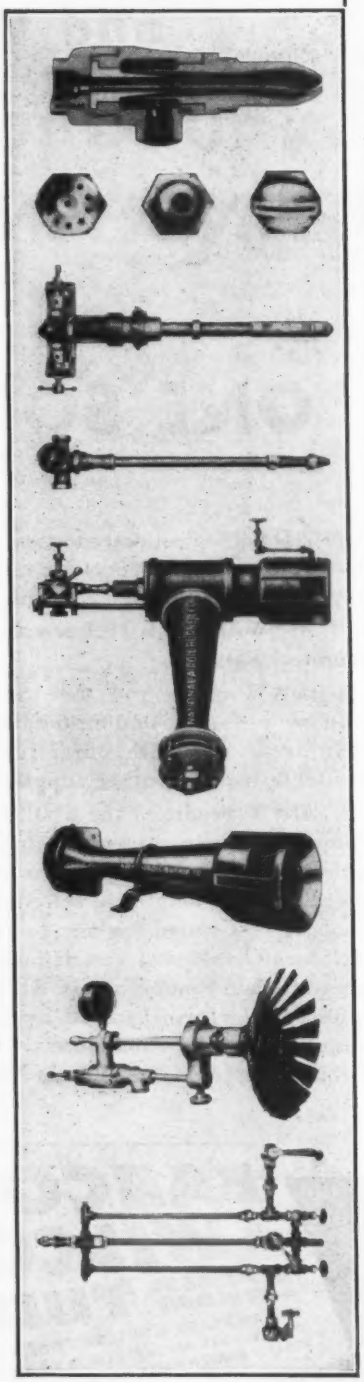

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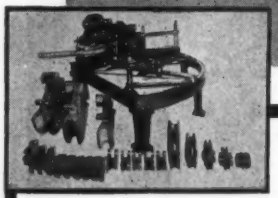

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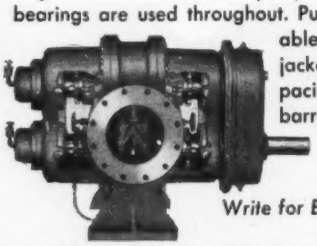

Write for Bulletin 18A

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REFINING

Imperial to Move Canol Refinery to Edmonton

TORONTO, Ont.—The Canol refinery at White Horse, Yukon Territory, purchased recently for $1,000,000 by Imperial Oil, Ltd., will be dismantled and moved to a new site near Edmonton.

C. E. Carson, Imperial director in charge of manufacturing, said transportation of plant facilities will begin immediately. Movement will be along the 918 miles of Alaskan highway route to Dawson Creek, B. C., and thence some 430 miles by rail to Edmonton.

The refinery will be set up on a 365-acre site near Edmonton purchased several weeks ago and is expected to be in operation before the end of 1948, Carson said. In addition to the White Horse plant, other equipment will be brought from Sarnia and other Imperial refining centers.

Cost of setting up the White Horse refinery was estimated by Carson at between $6,000,000 and $7,000,000, approximately the cost of a new plant. However, Carson said, the purchase will save an estimated 18 months of the time required to build an entirely new refinery.

The plant, with an initial capacity between 4,000 and 6,000 bbl. daily, will provide an outlet for the new Leduc field south of Edmonton.

Imperial officials some time ago indicated the construction of a refinery at Edmonton would be justified if the field attained a potential of 2,500 bbl. daily. While actual restricted production is below this figure, developments indicate that required potential can be obtained.

The White Horse refinery was built as a part of the Canol project to refine crude oil piped from Fort Norman field to provide products for Pacific war operations. It cost about $6,000,000 and in one year processed 975,764 bbl. of crude. The pipe line from Fort Norman to White Horse recently was sold for $700,000.

Stanolind Arranges Sale Of Chemical Byproducts

Stanolind Oil & Gas Co. has signed a contract with United States Industrial Chemicals, Inc., to sell its entire production of water soluble oxygenated chemicals from its proposed chemical separation plants, one of which will be built by Stanolind and the other by Carthage Hydrocol, Inc.

The plants, to be completed in about 2 years, will make synthetic gasoline from natural gas and large amounts of cheap oxygen.

Standard of California To Buy Surplus Plant

Standard Oil Co. of California will buy for $6,000,000 the Government-owned aviation-gasoline plant adjacent to the company's Richmond, Calif., refinery.

War Assets Administration, which announced the results of negotiations with the company, had fixed a fair market value price of $5,339,630 for the surplus property. Original cost of the plant was $21,214,949. It is located on land owned by the company and leased by the Government.

Included in the facilities are a 14,000-bbl. T.C.C. unit and a 3,200-bbl. HF alkylation unit.

Ashland Buys Land for New River Terminal

Ashland Oil & Refining Co. has purchased 30 acres of land at Jefferson, Ind., on the Ohio River where it plans to install a $250,000 river terminal.

The new plant will serve as distributing point for the company in southern Indiana and northern and western Kentucky.

Shell Lube Plant to Be Finished Next Summer

Completion of the new Shell Oil Co., Inc., five-unit, $10,000,000 Houston plant for the manufacture of a complete line of lubricating oils has been set for early summer in 1948.

Facilities for compounding or for the recovery of byproducts are not as yet included in the plans. It is expected that oil products of the new plant will be transported to Shell's California, Sewaren, and New Orleans plants for processing.

Production of 2,800 bbl. per day of finished lubricants is expected, including 1,800 bbl. of high-viscosity oils, 600 bbl. of medium oils, 200 bbl. of low-viscosity, and 200 bbl of miscellaneous oils.

Mason A. Rogers will be in charge

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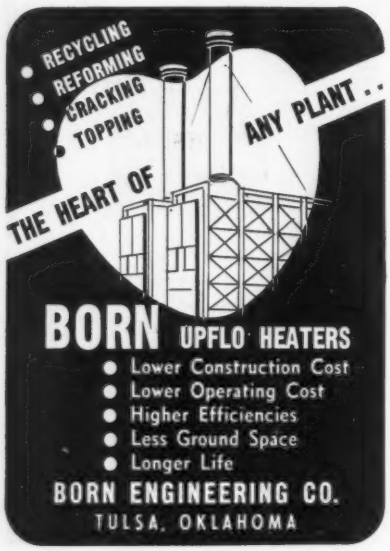
of over-all operations of the new lube plant and H. J. Lewis will be lube department manager.

Three contractors have charge of construction: Fluor Corp. is building all tankage, piping, utilities, railroads and hard surface roads; M. W. Kellogg Co. will erect the deasphalting and extraction units; and Lummus Co. will build the vacuum fractionating units, M.E.K. dewaxing units and the clay contact filter unit.



Continental Refinery Contract Is Awarded

The contract for the construction of Continental Oil Co.'s $8,500,000 refinery at Billings, Mont., has been awarded to Jones & Laughlin Supply Co., Tulsa. Work will begin next spring.

Continental officials report that the plant will have a daily crude-oil capacity of 7,500 bbl. and will manufacture high octane gasoline, burning fuel, and road asphalts. It will process crude oils from Continental's wells in Elk Basin, South Elk Basin, Cat Creek, and Frannie Creek fields.

Construction will also include a tank farm with a storage capacity of 700,000 bbl.

Panhandle Refinery Operating After Fire

WICHITA FALLS, Tex. — Panhandle Refining Co. resumed work this week after a fire which destroyed several warehouses, shops, and loading racks August 12. The plant's polymerization unit was only slightly damaged, and damage would amount to approximately $75,000, according to R. C. Stanford, vice president. Gasoline stocks burned amounted to about 50,000 gal.

North Texas and southern Oklahoma refiners came to the aid of Panhandle, and by combined efforts, were supplying some 125,000 gal. of gasoline daily, plus kerosine and distillates, to Panhandle Refining Co.'s customers.

Construction Begins on $3,000,000 Chemical Plant

Preliminary work toward the construction of a $3,000,000 chemical plant to produce aromatic and unsaturated hydrocarbon chemicals from natural gas was started August 13 near Winnie in Jefferson County, Texas, for McCarthy Chemical Co.

Final contract for construction of the plant is expected to be given soon. The plant is scheduled for completion in April 1948.

Huge Growth of Chemical Industry Cited by Egloff

More than 50 oil companies were listed as chemical manufacturers in the United States in 1946, whereas there was only one such listing in 1935, according to Dr. Gustav Egloff, director of research for Universal Oil Products Co.

Egloff, speaking before the Royal Institute of Chemistry in St. Andrews, Scotland, said less than 1 per cent of the oil production of the United States made possible in 1946 the production of 3,800,000,000 bbl. of organic chemicals, exclusive of aromatic hydrocarbons.

Faith in the future of the petro-Chemical industry in the United States, he said, is shown by an investment of more than $340,000,000 in installing plants in the Texas Gulf area alone.

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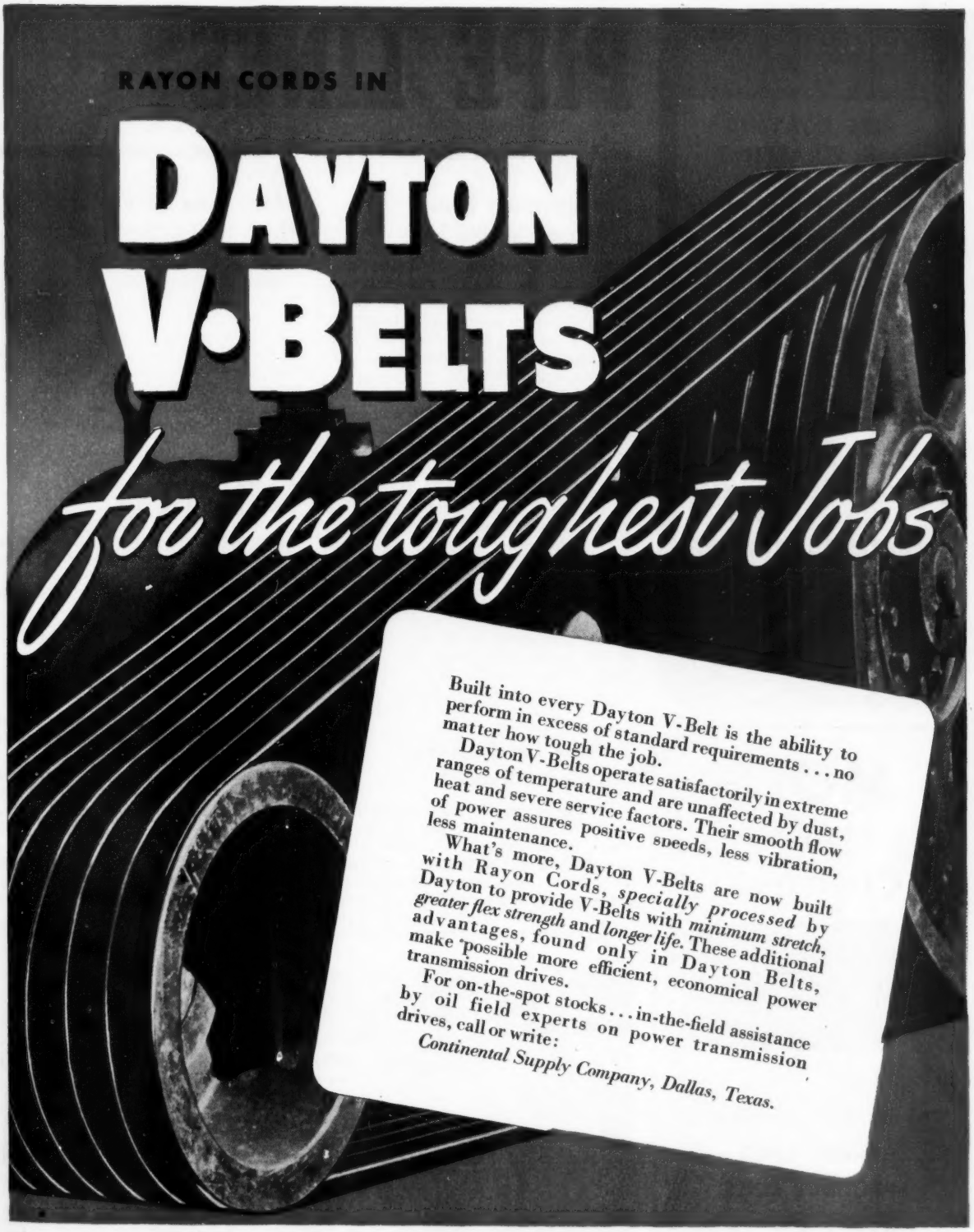
Contract is Awarded For Dow Chemical Plant

Contract for construction of a $4,000,000 chlorine plant for Dow Chemical Co. at Freeport, Tex., has been awarded Tellepsen Construction Co.

The plant is a part of a multi-million dollar expansion program announced by Dow last year. Construction of the plant originally was scheduled to begin last February but was held up because of material shortages.

Cooperative Moves Lubricating-Oil Train

A 100-car trainload of lubricating oils was shipped August 16 from the Coffeyville, Kans., refinery of Consumers Cooperative Association. The 100 cars were destined for various units of the association in the north and east.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PIPE LINES

Specifications Being Prepared for Big Line

The specifications are being prepared for the West Texas-Cushing, Okla., large-diameter crude-oil trunk line, which is being undertaken by Texas Pipe Line Co., Shell Pipe Line Corp., Sinclair Refining Co., and Empire Pipe Line Co.

Specifications will be issued early in September preparatory to receiving bids, approximately 2 weeks later and the letting of contracts before the end of the month.

Construction will start in October at the time of the first delivery of pipe. Since pipe will be furnished to the undertaking over a 12-month period, it is anticipated that the project will be completed about November 1, 1948.

The project covers a distance of 500 miles, consisting of 20 in. from Jal, N. M., to Midland, Tex.; 22 in. from Midland to Wichita Falls, Tex.; and 24 in. from Wichita Falls to Cushing.

Kansas Crude Runs Set 4-Year Record

Pipe-line runs of Kansas crude oil averaged 300,359 bbl. per day in the week ended August 11. This is the first time since 1943 that the 300,000-bbl. mark has been exceeded, the state conservation division reported.

Wyco Line Now More Than Half Completed

Wyco Pipe Line Co. laid 163 miles of line up to August 14 for its Casper, Wyo.-Denver, Colo., products line. This represents more than half of the 268 miles on the project.

Pipe laying is progressing at the rate of a mile a day. The line is to be finished in October. Operation will start in early January following completion of terminal facilities.

Texas Pipe Line Co. To Install Booster

Texas Pipe Line Co. is planning to install a booster station half way between Lockport, Ill., and East Chicago on the company's products pipeline system.

Stanolind Lets Contracts For Big Inch Looping

Stanolind Pipe Line Co. awarded contracts last week for looping of its main line as follows:

Associated Contractors & Engineers (Job 2), East Ft. Madison, Ill., to Spoon River, Ill., 65.5 miles of 20 in.; J. R. Horrigan Construction Co. (Job 3), Spoon River to Stanolind's Garfield Junction, 45.8 miles of 20 in. and 15.14 miles of 22 in.; O. C. Whitaker Co. (Job 4), Garfield Junction to

Left: John T. Eastman, pilot, Perrault Brothers; W. C. Allred, superintendent for R. B. Potashnick and partner in Allred & Enix Construction Co., pipe-line contractors; W. C. B. Whalley, corrosion engineer, Iraq Petroleum Co., Haifa, Palestine; and R. E. Shackleford, sales manager, Perrault Brothers, with Perrault Brothers airplane at 60-mile, 22-in. looping project of Mississippi River Fuel Corp., contracted by R. B. Potashnick. Right: Small ditcher which precedes large ditcher in two-stage ditching over rough terrain of Mississippi River Fuel Corp. looping now under construction near Farmington, Mo., 60 miles south of St. Louis

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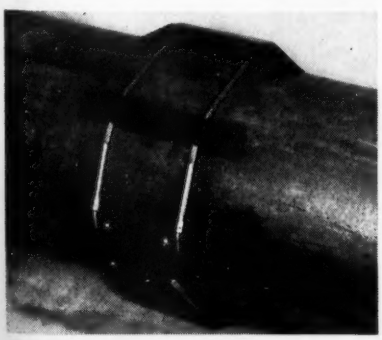
WRITE FOR LATEST INFORMATION

PIPE LINE CASING INSULATOR*



Williamson Pipe Line Casing Insulators are clamped around coated pipe 20 to 30 ft. apart before installing in right-of-way casing. Insulating blocks—hard and rugged—serve as skids, protecting pipe coating and insulating pipe from casing. Essential for cathodic protection.

*Patent Pending *Refer to Dept. J*

THE PIG WITH THE POKE CLEANS PIPE LINES
T. D. WILLIAMSON, INC.

Manhattan, Ill., 60.61 miles of 22 in.

Contractors are moving equipment to the job this week for immediate construction which will be completed between November 1 and November 15.

T.G.T. Pushing Extensive Line Looping Program

Tennessee Gas Transmssion Co. has let contracts for approximately 400 miles of looping construction. Contractors now engaged in the field include the following:

Latex Construction Co., 80 miles of 20 in, lateral; 122 miles of 26 in. in North Mississippi and southern Tennessee; J. R. Horrigan Construction Co., approximately 80 miles of 26 in.; Morrison Brothers Construction Co., Inc., 90 miles of 26 in. in northern Tennessee and southern Kentucky; Anderson Brothers, 80 miles of 26 in. ir Eastern Kentucky.

The Tennessee Gas Transmission Co. is putting a spread of its own in the field to construct 40 miles of 26 in. over a difficult terrain in Mississippi. At present this spread is engaged in river crossing construction. This is the first time that T.G.T. has put a spread of its own on pipe-line construction.

Sinclair 190-Mile Line Now Half Completed

Construction of Sinclair Refining Co.'s 8-in. products pipe line from the company's Corpus Christi refinery to Austin has passed the halfway mark.

Company officials said preparations now are being made to start operations on the company's 6-in. products line from San Antonio to Luling, to tie into the Corpus Christi-Austin line.

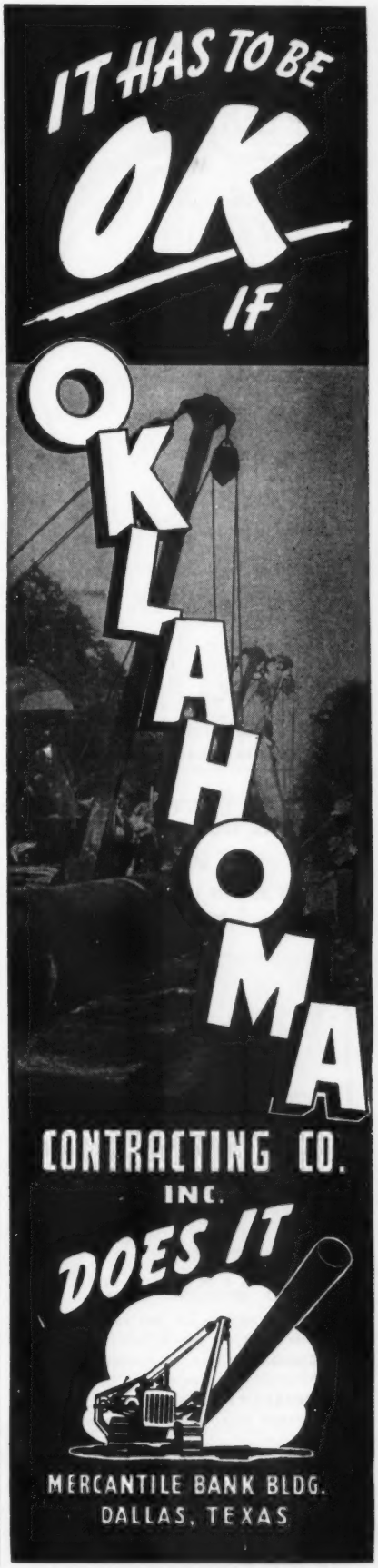
The 190-mile Corpus Christi-Austin line is expected to cost about $4,000,000.

360 Miles Finished on Texas-California Line

El Paso Natural Gas Co. had competed 360 miles of 26-in. early this week in the construction of its trunk line for transmitting West Texas and New Mexico gas for delivery into Pacific Lighting Corp. group's 30-in. line at Blythe, Calif.

To complete this 740-mile project, there remains to be laid 380 miles. Work is being done by four spreads. Three of these are operated by the El Paso Natural organization under the direct supervision of C. L. Perkins, vice president and general superintendent.

One spread is operating on the section of the project contracted by Mid-



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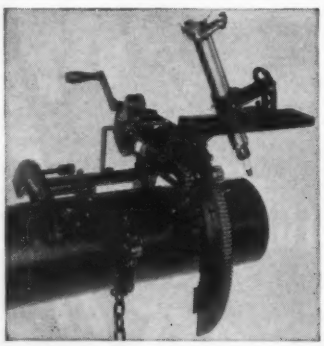
Maximum SPEED
Minimum COST



The H & M PIPE CUTTING and BEVELING MACHINE

SPEED: Complete cut and bevel can be made on 12 inch pipe in about 2 minutes.

ECONOMY: Save approximately one-half labor and gas costs.

PORTABILITY: Can easily be carried from one pipe section to another.

Write for Literature

The H & M
Pipe Beveling Machine Co.
611 Petroleum Building, Tulsa, Oklahoma

western Constructors, Inc., and S-W-D Co.

Lakin-Denver Line Will Be in Operation Soon

Gas from the 240-mile Lakin-Denver pipe line of Interstate Gas Co. is scheduled to be turned into Denver's gas mains by October 15, giving the city an additional 100,000,000 cu. ft. of natural gas daily to meet an unprecedented industrial and home-heating requirements.

The line reached the East Denver control station, 4 miles east of Aurora last week, 3 weeks ahead of schedule, and construction was scheduled immediately on the north arm of the Denver loop to connect with the North Denver meter station. Upon completion of this arm, the south link connecting with the Amarillo-Pueblo-Denver line south of Denver will be built.

By 1950 the new line is expected to be carrying 175,000,000 cu. ft. of gas daily, and by 1955, following completion of plans to tap new resources in Hugoton and Panhandle fields, the combined capacity of the Lakin-Denver and the Amarillo-Pueblo-Denver lines is expected to total 400,000,000 cu. ft. daily.

Three Lines to Increase Imperial Refinery Output

SARNIA, Ont.—The throughput of Imperial Oil, Ltd., refinery here will be stepped up from 42,000 to 45,000 bbl. daily with construction of three new pipe lines from Froomfield to the refinery.

An 8-in. line, 5 miles long, has just been finished, and one 8-in. and one 6-in. line are included in the program.

New T.G.T.C. Line Begins Operations

The Tennessee Gas Transmission Co.'s 99-mile, 16-in. natural-gas pipe line has been placed in operation. It runs from San Salvador field in the Rio Grande Valley to the company's main line at Agua Dulce, Nueces County.

The new line, with a capacity of about 100,000,000 cu. ft. of gas daily, will carry only about half capacity while in early operations.

Socony-Vacuum Project Set

Socony-Vacuum Oil Co. is expected to start work within a month on a 6-in., 135-mile pipe line from Portland to Bangor, Me. A company official reported that easements have already been obtained on several pieces of property in the Portland area.

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Underground Pipe Wrap

- Non-Corrosive
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Better prepared to undertake any job in pipe line construction. Complete, modern equipment, experienced personnel, and a personal pride in giving you complete, satisfactory service in the shortest possible time—that's why we're doing a better pipe line job! When you plan your next pipe line, give us a call.

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YOU ARE REALLY PUTTING MONEY IN THE BANK!

For the finest protection that money can buy, insist on *Perrault Glass Pipe Wrap. Its great strength, superior construction and strong resistance to moisture and corrosion give BETTER protection, for years LONGER. Always uniform in thickness, width and weight, you'll find *Perrault Glass Pipe Wrap easy and economical to use.

1. **Excellent tensile strength plus extremely light weight provide for quick and easy application.**
2. ***Perrault Glass Pipe Wrap has a natural initial absorbency which allows it to pick up more coating than other materials of the same thickness and helps eliminate "holidays."**
3. ***Perrault Glass Pipe Wrap resists organic solvents and acids in soil.**
4. **Changes in temperature encountered in application and use have no effect on *Perrault Glass Pipe Wrap.**
5. ***Perrault Glass Pipe Wrap is non-corrosive and has no contact-reaction with metal.**
6. **The glass filaments in *Perrault Glass Pipe Wrap cannot absorb moisture.**

**Manufactured and Engineered by the Glasfloss Corporation for Distribution by Perrault Brothers.*

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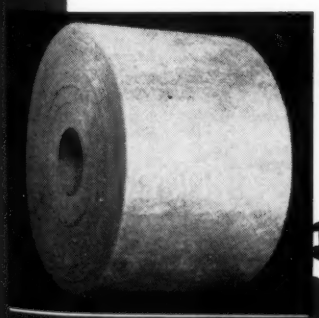
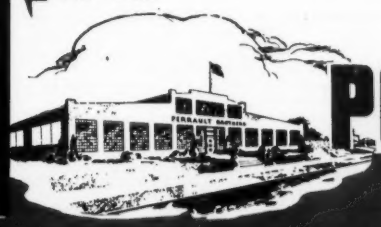


Manufactured in rolls 4", 6", 9", 12", 18" wide; 400 feet long with 3½" core.



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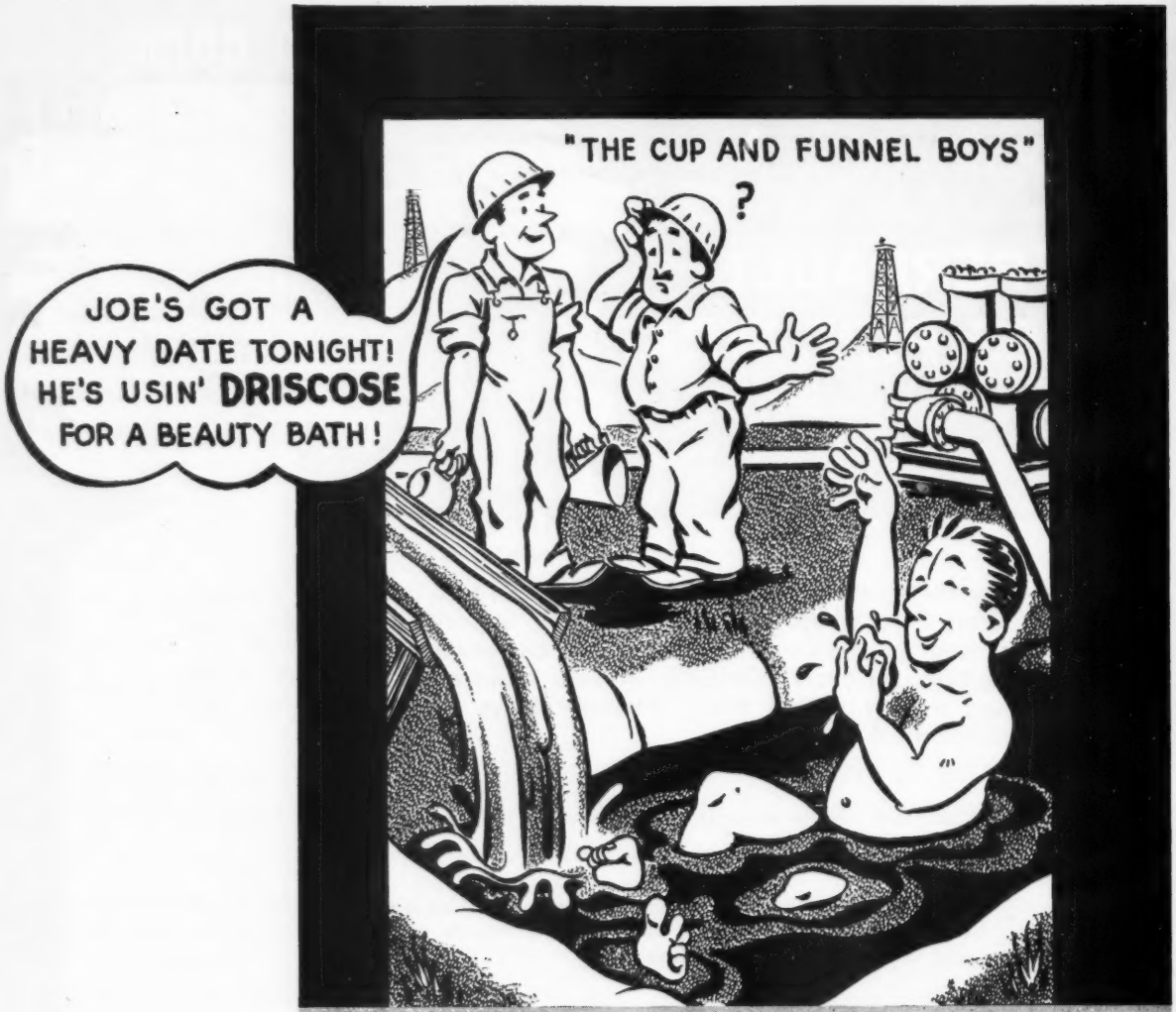

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DRISCOSE

Exploration and Drilling

What the Geologists Need

THE American Association of Petroleum Geologists, through its Research Committee, has submitted to the American Petroleum Institute's advisory committee on fundamental research on occurence and recovery of petroleum, a formal program of geological research, with the idea that the A.P.I. will arrange for financing.

This is a program that has been carefully worked out over a period of several years, with varying amounts of aid from literally hundreds of petroleum geologists, to fill in the gaps in geological knowledge that seem most important from the standpoint of finding more oil, finding it more cheaply, and recovering the oil more cheaply after it is found. Therefore it gives a clue to what the geologists are thinking and what they have decided it is most important for them to know.

They state that their number one objective is to learn more about sedimentology. This is a broad term, involving not only the sediments themselves, but the conditions and environment under which they were laid down, their original source, and what happened to them after they were deposited. They divide this into two broad groups of characteristics, in point of time. These are a study of the feaures of the rocks which are the result of original conditions of deposition, and those which are the results of changes which occur in the rocks after deposition. This includes, among other things, study of the nature and distribution of formation fluids, as well as the rocks themselves.

The over-all program as recommended to the A.P.I. is broken down into segments, and percentages assigned to each which indicate the relative importance and relative amount of work which should be done on each during the first year. After that, developments naturally may result in changes in emphasis. Thus the first-year program suggests 5 per cent of the emphasis be placed on clastic sediments (sands, silt, clays); and 35 per cent on carbonate sediments (limestone, dolomite, etc.) Within these two groups, a further breakdown is made.

Two surveys of recent sediments in the Gulf Coastal area are recommended to receive 35 per cent of the total emphasis of the entire program. These are, (1) a "Survey of Marine Sediments, Including Part of Clay Mineral Investigation, Northwestern Gulf of Mexico," which includes completion of work now under way at Woods Hole Oceanographic Institution; (2) "Survey of Brackish Sediments, Including Part of Clay Mineral Investigation, Mississippi Delta Area."

For "Ancient Clastic Sediments, Including Part of Clay Mineral Investigation," 10 per cent of the total program is suggested. An additional 10 per cent is suggested for "Clay-Ion Water Relationships in Environments of Oil Production" and "Adsorption of Organic Matter to Clay Minerals." Still another 10 per cent is suggested for "Re-Collection and Description of Material from Well-Known Clay Localities" and "Crystal Structure, Isomorphous Substitution, and Base Exchange."

The 35 per cent suggested for the Carbonate section of the sedimentology program, is divided into three parts. For a study of carbonate porosity, 20 per cent is suggested for two projects: "Fullerton Field, Andrews County, Texas," and "Florida Pleistocene." For a survey of the distribution of naturally occurring carbonates, 10 per cent is suggested for two projects: "Recent Carbonates and Environments of Deposition," and "Ancient Carbonates." The third part of this carbonate project, with a suggested 5 per cent emphasis is: "Phase Relationships in Carbonate and Sulfate Systems."

Discussion about the relative merits of the various portions of the program and the comparative degrees of emphasis can be, and has been, long. There has to be a start somewhere, and this is what has finally been agreed to. Despite the apparent separateness of many of the projects, all are designed so that in actual execution, they will be interrelated and knowledge gained from one project will ultimately add to the effectiveness of the prosecution of all other investigations.

This is what the petroleum geologists say they need to increase their ability to find more oil, to find it more cheaply, and to improve techniques of recovering it more completely and at lower cost.

SOUTH LOUISIANA

Texas Co. Completes World's Deepest Producer

NEW ORLEANS.—The Texas Co. has completed the deepest producer in the world at its 1 Lafourche Basin Levee district, 30-20s-25e, in Queen Bess Island area of Jefferson Parish. This well is completed from a record depth just slightly deeper than Shell Oil Co., Inc.'s deepest producer at Weeks Island field in Iberia Parish. Production is through perforations at 13,879-13,904 ft. On potential it flowed 49 bbl. of condensate and 6,188,296 cu. ft. of gas per day through a ¼-in. choke. Total depth is 15,523 ft., with op of sand at 13,879 ft.

New gas-condensate production has been opened by The California Co. 9 E. P. Brady et al, Unit 1, 2-16s-23e, in South Barataria area. Drilled to a total depth of 12,307 ft., with top of sand at 11,821 ft., this well produced 168 bbl. of condensate per day and 5,708,000 cu. ft. of gas through a ¼-in. choke. Gas-condensate ratio is 33,976, with tubing pressure 4,600 psi. Gravity is 48.8°, with no water in the flow. Perforations were made at 11,821-66 ft.

Magnolia Petroleum Co. 20 B. T. Wait opened new gas-condensate sand at Iowa field in Calcasieu Parish. This is the deepest test for the field, having reached total depth of 10,107 ft. in salt. On initial production test it flowed 181 bbl. of condensate per day through a 10/64-in. choke, gas-condensate ratio 12,267, tubing pressure 5,800 psi., gravity 43.7°, with no water. Production is through perforations at 9,476-78 ft., with op of sand at 9,474 ft.

Shell 1 Opendweyer-Alcus Cypress, wildcat test off the north flank of the St. Gabriel dome in Iberville Parish, is testing for production. Possible oil sands were indicated by log at 10,910-40 ft. Total depth is 11,000 ft., with 7-in. casing in the hole to 10,191 ft. Perforations were made for the test at 9,784-99 ft.

SOUTH LOUISIANA SUCCESSFUL WILDCATS

Calcasieu Parish: New gas-condensate sand, Iowa field—Magnolia Petroleum Co. 20 B. T. Wait, 12-9s-7w, TD 10,107 ft., top sand 9,474 ft., perf. 9,476-78 ft., IP: 181 bbl. condensate per day through a 10/64-in. choke, gas-condensate ratio 12,267, TP 5,800 psi., gravity 43.7°, no water. (This is first test to go into salt and deepest test for the field).

Jefferson Parish: New gas-condensate pool, South Barataria field—The California Co. 9 E. P. Brady et al, Unit 1, 2-16s-23e, TD 12,307 ft., top sand 11,821 ft., perf. 11,821-66 ft., IP: 168 bbl. condensate per day and 5,708,000 cu. ft. gas per day through a ¼-in. choke, gas-condensate ratio 33,976, TP 4,600 psi., gravity 48.8°, no water.

New gas-condensate pool, Queen Bess Island—World's deepest producer—The Texas Co. 1 Lafourche Basin Levee District-Queen Bess Island. 30-20s-25e, TD 15,523 ft., top sand 13,879 ft., perf. 13,-

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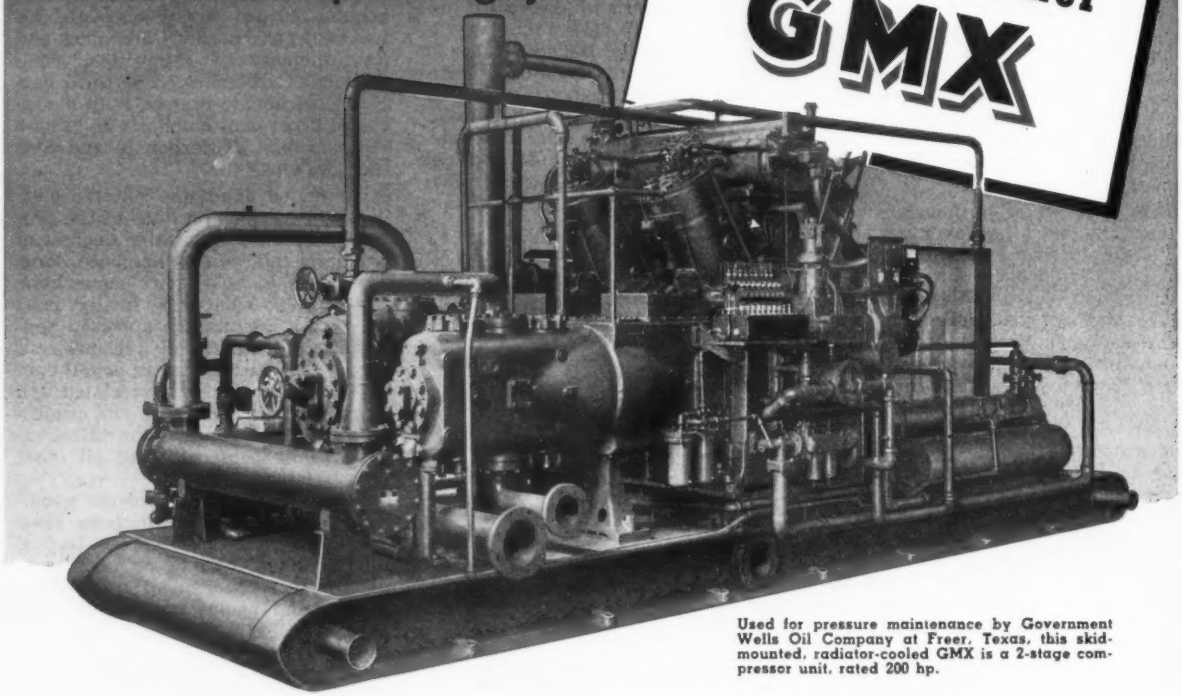
Perfect for those smaller compressing jobs

The **Cooper-Bessemer GMX**



Used for pressure maintenance by Government Wells Oil Company at Freer, Texas, this skid-mounted, radiator-cooled GMX is a 2-stage compressor unit, rated 200 hp.

SMALLEST member of Cooper-Bessemer's modern V-angle, gas-engine-driven compressor line, the GMX is available for permanent installation, or as a truly portable, skid-mounted, 4-cylinder unit as shown. Built also in 6 and 8 cylinder sizes, it meets all compressor requirements from 200 to 400 bhp.

Here, for those smaller jobs, is a compressor that offers every outstanding feature of the famous Cooper-Bessemer GMV — all the ruggedness, exceptional economy and low maintenance that has made the GMV a preferred compressor for the industry's toughest jobs.

A complete line of GMX compressor cylinders is available for any pressure and flow within the horsepower range. Yes, the GMX offers you exceptional performance in many services including field-to-line booster service, small field pressure maintenance, and gas lift service. Send for the comprehensive GMX Bulletin 338.

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879-904 ft., IP: 49 bbl. condensate per day and 6,188,296 cu. ft. gas per day through a ¼-in. choke, gas-condensate ratio 111,000, TP 4,200 psi., gravity 44.1°, no water.

SOUTH LOUISIANA WILDCAT FAILURE

Calcasieu Parish: Gulf Refining Co. 3-A Louisiana Sulphur Mining Co., Edgerly area, 33-9s-11w, dry, TD 9,650 ft.

TEXAS GULF COAST

New Field Opened In Tyler County

HOUSTON. — Five miles west-southwest of Fred and approximately 3 miles north of North Beach Creek production, in Tyler County, American Republics Corp. 1 Kirby Lumber Co. et al, in the Wurtsbaugh area, has opened a new oil field. On potential gage the well flowed 58 bbl. of oil and 44 bbl. of salt water per day through a ½-in. choke with gas ratio of 3,767. Total depth is 10,757 ft., and production is through perforations at 9,070-78 ft.

Union Producing Co. 7-A A. M. McFaddin, oil discovery well in East McFaddin gas field of Victoria County, has been gaged at 92 bbl. of 38.4°-gravity oil per day through a ⅛-in. choke, with gas-oil ratio of 791, tubing pressure 600 psi., and casing 1,730 psi. Production is through perforations at 5,940-42 ft. Total depth is 7,715 ft. with top of oil pay at 5,935 ft. This well is in the Maria J. Traviesa Grant, 2,334 ft. northeast of the 2-A McFaddin gas well.

Humble Oil & Refining Co. has completed a low-gravity oil discovery in the Sugar Valley field area of Matagorda County. Its 1 Truitt & Gravier et al, 1 mile southeast of deep, high-gravity-oil production on the east side of Sugar Valley field, on initial production gage flowed 172 bbl. oil per day through a ¼-in. choke with 350 psi. flowing pressure on the tubing and a gas ratio of 663. Gravity of the oil is 28.1° corrected. Total depth is 11,486 ft., and 5½-in. casing was cemented to 10,296 ft.

Butcher-Arthur, Inc., has opened new Cockfield production in the old Wilcox producing area at Coldspring field in San Jacinto County. It is from a well originally drilled by Navarro Oil Co. as 2 Foster Lumber Co. Butcher-Arthur designated it as the 2-D Foster, plugged the hole back from 7,865 ft. and perforated with 24 shots from 4,414-22 ft. On potential gage it flowed 107 bbl. of oil daily through a 7/64-in. choke with a gas ratio of 600. Flowing pressure on tubing is 900 psi., and no water in the flow. Original completion by Navarro was in the Wilcox sand, topped at 7,861 ft., and produced from open hole to the total depth, gaging at time of completion 38 bbl. daily.

TEXAS GULF COAST SUCCESSFUL WILDCATS

Tyler County: New oil discovery, Wurtsbaugh — American Republic Corp. 1 Kirby Lumber Co. et al, in Sara Fields Sur., 5 mi. WSW of Fred and approx. 3 mi. N of North Beach Creek production, TD 10,757 ft., PB 9,078 ft., top sand 9,070 ft., perf. 9,070-78 ft., IP: 58 bbl. oil and 44 bbl. salt water per day through a ½-in. choke, gas-oil ratio 3,767, tubing pressure 200 psi., gravity 42.9°, 43 per cent water.

Victoria County: New oil discovery for East McFaddin—Union Producing Co. 7-A A. M. McFaddin, in M. J. Traviesa Grant, TD 7,715 ft., top sand 5,935 ft., perf. 5,940-42 ft., IP: 92 bbl. oil per day through a ⅛-in. choke, gas-oil ratio 791, TP 600 psi., CP 1,730 psi., gravity 38.4°, no water.

Wharton County: New gas sand, El Campo —Seaboard Oil Co. of Dela. 1-B R. Holub, in W. D. Ivey Sur., TD 7,726 ft., sand 6,094-6,101 ft., perf. 6,093-6,100 ft., IP: 15 bbl. condensate per day and 3,232,000 cu. ft. gas per day through a ¼-in. choke and open flow calculation of 6,500,000 cu. ft. gas per day, IP 2,190 psi., 53°-gravity, no water.

TEXAS GULF COAST WILDCAT FAILURES

Jasper County: Standard Oil Co. of Texas 1 Kirby Lumber Co., Gist prospect, T&NO Sur., dry, TD 8,008 ft.

Lee County: United North and South Dev. Co. 1 Wm. Baine Estate, in Ira Elemons Sur., 3 mi. N of Lexington townsite, dry, TD 6,434 ft. in Edwards lime.

Tyler County: Grubb & Hawkins 1 Kirby Lumber Co., in J. J. Pemberton Lge., 7 mi. E of Spurger, dry, TD 7,500 ft.

Walker County: Moran Oil Corp. 1 D. R. Hardy, in Jno. Saddler Sur., ½ mi. SW of New Waverly, dry, TD 3,805 ft.

Washington County: Union Sulphur Co., Inc., 1 Joe Kibeczka, Chapel Hill area, in Wm. Munson Sur., dry, TD 10,965 ft. Top Wilcox 6,724 ft.

Wharton County: Floyd L. Karsten 1 Mrs. M. G. Willis, South El Campo area, ETRR Sur., dry, TD 7,035 ft.

Sam G. Harrison 1 M. A. Fraley et al, WCRR Sur., 3 mi. S of Glenflora, dry, TD 5,840 ft.

EASTERN TEXAS

Standard Test Gets 120 Ft. of Oil

DALLAS.—Standard Oil Co. of Texas 1 Bates, Grayson County wildcat 2 miles north of Sherman, reported additional oil in a second drill-stem test. First test, from 3,270-85 ft., recovered 217 ft. of oil. The second test, at 3,419-26 ft., open 1 hour, put gas to the surface in 23 minutes, and re-

GILBERT

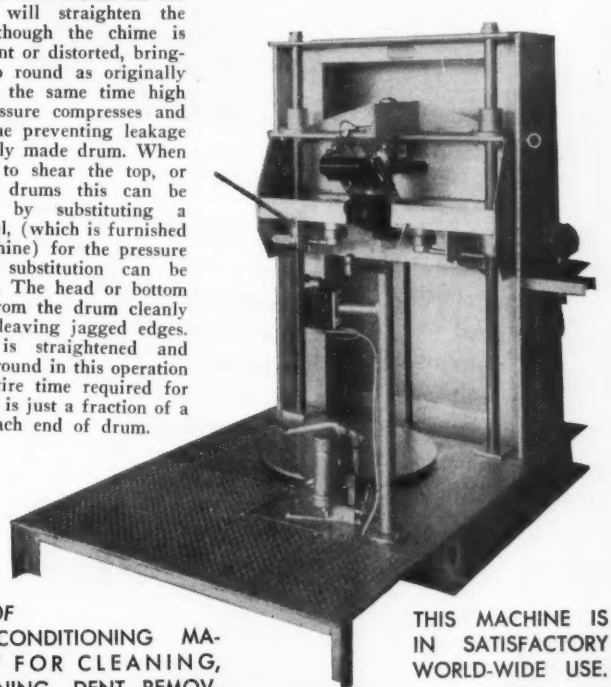
MODEL DM-1 UNIVERSAL ELECTRO-HYDRAULIC

CHIME MACHINE

STRAIGHTENS CHIMES, STOPS CHIME LEAKS, AND WILL REMOVE HEAD OR BOTTOM FROM

STEEL SHIPPING DRUMS

This Machine reconditions the chimes of used steel drums. At one operation it will straighten the chime even though the chime is very badly bent or distorted, bringing same into round as originally made and at the same time high hydraulic pressure compresses and rolls the chime preventing leakage in any properly made drum. When it is desired to shear the top, or bottom from drums this can be accomplished by substituting a shearing wheel, (which is furnished with the machine) for the pressure wheel. This substitution can be made quickly. The head or bottom can be cut from the drum cleanly and without leaving jagged edges. The chime is straightened and brought into round in this operation also. The entire time required for any operation is just a fraction of a minute for each end of drum.



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THIS MACHINE IS IN SATISFACTORY WORLD-WIDE USE.

"OUR BEST SALESMEN ARE THE MACHINES WE BUILD."

L. M. GILBERT COMPANY,

Philadelphia 6, Pa., U. S. A.

covered 120 ft. of clean oil, 90 ft. of oil and gas-cut mud, and 60 ft. of salt water. Bottom-hole pressure rose to 1,225 lb. in 20 minutes.

In Wood County, Humble Oil & Refining Co. 1 Rio Oil Corp. was waiting on pump at plugged-back total depth of 8,025 ft. Last reported tests, from perforations at 7,932-42 and 7,942-50 ft., had fluid at the surface in 3 minutes. It was allowed to clean itself and when turned into separator, flowed at the rate of 1,489,488 cu. ft. of gas a day and 111.36 bbl. of 61.1°-gravity, water-white distillate. The flow was through ⅛-in. choke, on a flowing tubing pressure of 2,200-2,500 lb.

In Anderson County, 3 miles east of Blackfoot, Sanders & Murchison 1 R. F. Broadway, was drilling ahead below 10,081 ft. in sand and shale. Sample tops reported were: Travis Peak 9,880-82 ft., James limestone 9,450-60 ft., and the Pettit a 9,645-50 ft. Northwest of Slocum, Anderson County, Continental Oil Co. 1 F. M. Royall was below 9,290 ft. in sand and shale.

P. H. Pewitt 1-E Pickering Lumber Co., 4 miles southeast of Joaquin, Shelby County, was drilling below 5,221 ft. in shale, toward its 7,000-ft. goal. Location is 2 miles south of production.

EAST TEXAS SUCCESSFUL WILDCAT

Houston County: Geier & Jackson Recyling Co. 1 A. D. Adams, L. Purdy Sur., 5 mi. NW Grapeland field, flowed 220 bbl. 41°-gravity oil in 24 hours, sub-Clarksville 5,887-93 ft., TD 6,015 ft., flow through 3/16-in. choke, tubing pressure 975 lb., casing pressure 1,150 lb., GOR 1,291:1.

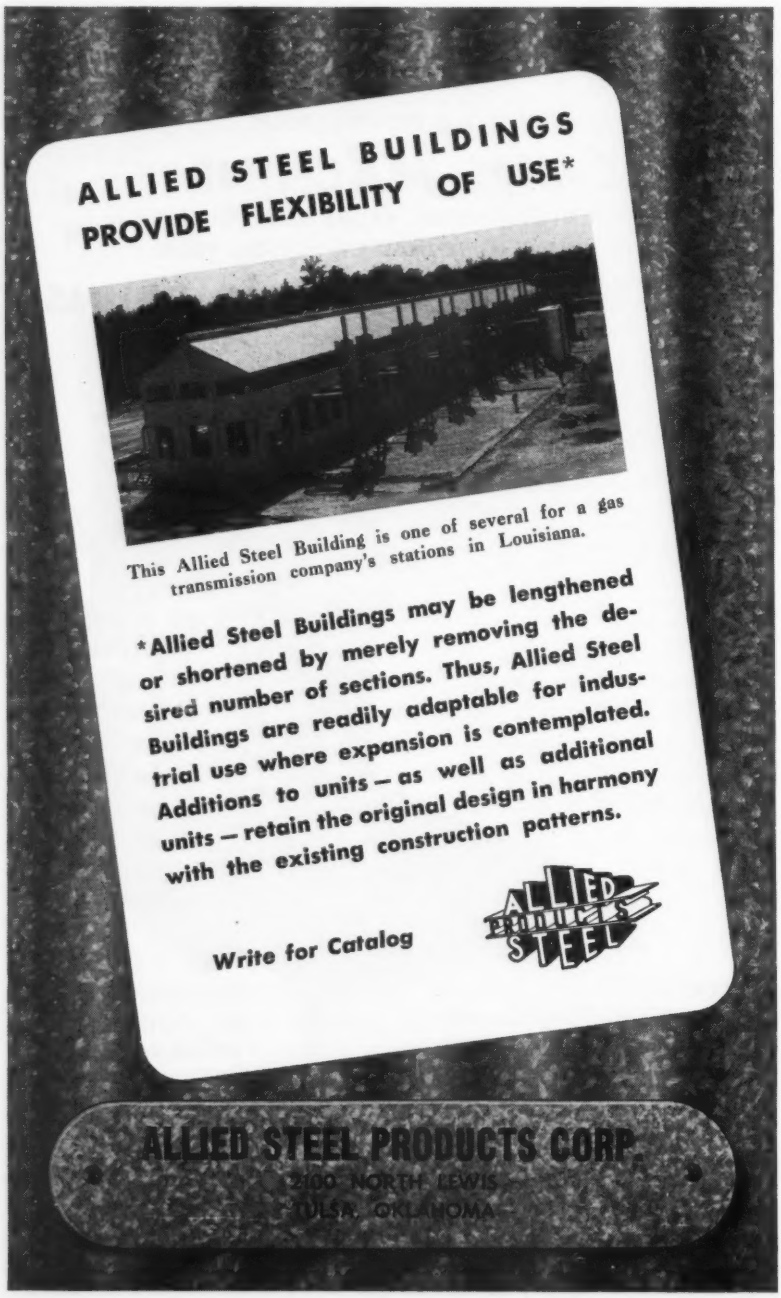
EAST TEXAS WILDCAT FAILURES

Anderson County: Cecil Stein 4 Southern Pine Lumber Co., M. Rogers Sur., Camp Hill area, dry, TD 720 ft.

Cherokee County: Watson W. Wise 1 Roxie Ross, Levi Jordan Sur., 6 mi. SW Rusk, N of William Wise field, dry, TD 5,150 ft., Austin 4,830 ft., Woodbine 5,073 ft., Woodbine sand 5,078 ft., by samples.

Robertson County: Maner Graham and J. E. Davant 1 John and Kate Fagin, Charles Hensley Sur., 3 mi. NE Calvert, dry, TD 5,210 ft., Midway 1,290 ft., Nacatoch 2,058 ft., Austin 4,380 ft., Grayson 5,150 ft.

Rusk County: O. V. Mullins 1 J. C. Jones, Richard Magee Sur., 3 mi. N Henderson, dry, TD 7,321 ft., no details available.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N. CENTRAL TEXAS

Texas Co. Test Reports Gas and Oil Shows

WICHITA FALLS.—The Texas Co. 1 Schmeker, wildcat in northwest Wilbarger County, 1 mile southwest of the town of Odell, reported shows of gas and oil. A drill-stem test at 5,668-78 ft. produced a blow of gas and recovered 85 ft. of gas-cut drilling mud and a show of oil. Operators drilled another 10 ft. and were preparing to run a second test.

Seven miles southwest of Jacksboro, and considered a semiwildcat, A. R. Dillard 1 S. W. Leatherwood, WCRR Survey, took a 30-minute drill-stem test in conglomerate at 4,742-44 ft. There was some recovery of free oil, and gas was estimated at nearly 7,000,000 cu. ft. a day. Flowing pressure was 700 lb., with bottom-hole pressure at 2,050 lb. Southwest of Perrin, Jack County, Continental Oil Co. was running a test on the lower Bend conglomerate at 4,818-30 ft. at its 1 J. Smith, a wildcat in Section 2,564, TE&L Survey. Operators had reported some shows of oil in the section while drilling.

In Denton County, 5 miles south of Sanger, The Texas Co. 1 Saunders continued testing through perforations at 2,410-13 ft., but was bailing only brackish water. This section had previously yielded some oil on a drill-stem test. In Grayson County, Standard Oil Co. of Texas 1 Covey-Bates, 2 miles north of Sherman, cored from 3,285-3,303 ft. Recovery was 2 ft. of sand with a stain of oil, 2 ft. of shale, 8 ft. of oil sand, and 3 ft. of stained sand. Previously, a drill-stem test at 3,270-85 ft. recovered 217 ft. of oil and gas-cut mud after the tool was open 1 hour.

NORTH CENTRAL TEXAS SUCCESSFUL WILDCAT

Young County: Roy H. King 1 W. P. Stinson, H. M. Jones Sur., A-1,612, 3 mi. N Eliasville, DST 3,340-50 ft. in Caddo topped at 3,337 ft., estimated 30,000,000 cu. ft. gas a day after open 6 minutes, shut-in pressure 1,200 lb., TD 3,360 ft.

NORTH CENTRAL TEXAS WILDCAT FAILURES

Archer County: E. B. Clark 2 J. D. Lyles, Sec. 7, Hooper & Wade Sur., A-234, 4 mi. S Mankins, dry, TD 5,265 ft., Mississippi 5,065 ft., Ellenburger 5,206 ft.

G. E. Kadane & Sons 1 W. C. Frey "C," Sec. 15, Palo Pinto School Land Sur., 3 mi. N Dundee, dry, TD 4,378 ft., limestone 4,025 ft., sand 4,375 ft.

Montague County: B. F. Phillips 1 F. P. Sherrill, Blk. 4, Calhoun Sur., Lodge 112, 1 mi. NW Dyemond, dry, TD 3,507 ft., sand 3,277-3,328 ft.

Wilbarger County: Fain & McGaha 1 M. L. Sharp, Sec. 67, Blk. 12, H&TC Sur., 4 mi. SE Vernon, dry, TD 5,524 ft., limestone with show of oil 5,143-47 ft., DST recovered mud.

WEST CENTRAL TEXAS SUCCESSFUL WILDCAT

Shackelford County: Big West Drilling Co. 1 T. G. Hendrick, Sec. 8, Blk. A, AB&M Sur., 18 mi. NW Albany, pumped 156.7

bbl. 41°-gravity oil a day, Ellenburger 5,254-68 ft., TD 5,268 ft., GOR 350:1.

WEST CENTRAL TEXAS WILDCAT FAILURES

Coleman County: Horace E. White 1 J. D. Herring, Sec. 40, H. Taylor Sur., 2½ mi. SE Novice, dry, TD 3,616 ft., Gardner sand 3,471-91 ft.

Shackelford County: Big West Drilling Co. 1 T. G. Hendricks 3-B, Sec. 1, ACH&B Sur., NW corner of county, dry, TD 5,405 ft., Cook sand 1,610 ft., Canyon 2,061 ft., Palo Pinto 3,193-3,300 ft., Strawn sand 3,300 ft., limestone 3,491 ft., Caddo 4,857 ft., Mississippi 5,043 ft., Ellenburger 5,191 ft., light stain 5,102 ft., no recovery on DST, elevation 1,608 ft.

B. F. Whitaker 1 Annie Vickers, Sec. 212, ETRR Sur., 3 mi. E Lueders, dry, TD 1,630 ft., sand with show oil 1,605-15 ft.

CALIFORNIA

Shell Opens New Zone In Signal Hill Field

LOS ANGELES.—An official announcement by Shell Oil Co., Inc., during the past week has definitely confirmed recent rumors that the company has opened a new deep producing zone in Signal Hill field with its 2 Dolley, 29-4s-29w. According to the announcement, the well was completed on July 14 for 1,008 bbl. of clean 32.8°-gravity crude. Water cut was 17 per cent, and the crude flow was accompanied by 1,012,000 cu. ft. of gas. Tubing pressure was 1,850 lb. and casing pressure 1,700 lb. During the initial test a 16/64-in. choke was in place for the first 5½ hours and a 18/64-in. choke for the remaining 18½ hours.

According to Shell, the well was completed to produce the interval 10,030-10,365 ft., thought to be the De Soto-Dormax sand, through a combination string of 2½ and 2-in. tubing hung at 9,941 ft. Seven-inch casing was set at 10,030 ft. and 5-in. liner landed opposite the interval 9,968-10,361 ft. The liner was perforated throughout the interval 10,056-10,317 ft. The well originally was carried to a total depth of 10,544 ft., but later plugged back to 10,365 ft.

More recent production gages released by the company show the well to have been producing at the rate of 726 bbl. daily on July 17. During this stage, water cut was 17 per cent and accompanying gas flow was estimated at 700,000 cu. ft. daily. Tubing pressure was recorded as 2,275 lb. and casing pressure as 3,300 lb. Flow was through a 11.5/64-in. choke. On August 7 the well flowed 519 bbl. of clean oil through a 10/64-in. choke. Water cut during this later test had decreased to 4.2 per cent and gas flow to an estimated 518,000 cu. ft. daily. Tubing pressure was 2,950 lb. and casing pressure 3,100 lb.

Standard Oil Co. of California apparently has decided to explore deeper in order to secure more geological information at its second test in the Montalvo area of Ventura County. Evidence of this is the fact that the company currently is coring ahead below 9,380 ft. and its 65-3 McGrath, 30-2n-22w, a venture located very near its recent Oxnard discovery, already nearly 1,000 ft. below the discovery depth. Meanwhile, the company's 1 Maxwell, 3½ miles to the northeast, continues to drill ahead below 10,280 ft.

Sharpless Oil Corp., which recently opened a new northeast extension to Coalinga field in Fresno County, has just put the finishing touches on its 2 Hyde, 6-19s-16e, confirmation test to the discovery. The well, with an elevation of 620 ft., was drilled to a total depth of 8,279 ft. and 7-in. casing set at 8,278 ft. The casing was then perforated opposite the interval 8,240-57 ft. and 2½-in. tubing hung at 8,217 ft. Initial flow of the well was estimated at 1,000 bbl. daily. This new extension area of Coalinga field is a monoclinal structure with the oil held in a stratigraphic trap.

Long Beach Oil Development Co. recently has entered into an agreement with the Long Beach Harbor Commission whereby it will drill 40 new wells on harbor lands. Foundations are currently being erected for the first 10 of these wells, which are expected to get under way within the next few days.

British-American Oil Producing Co. has added the third producing well in the Alondra area with the completion of its 1 Park Community at 9,238 ft. Production of the well, which is located in 22-3s-14w, has not yet been announced, but it is said to compare favorably with production of the two producers previously completed. Normal course of operations at the 1 Park Community was delayed by an extremely difficult fishing job when drill pipe became stuck.

CALIFORNIA SUCCESSFUL WILDCATS

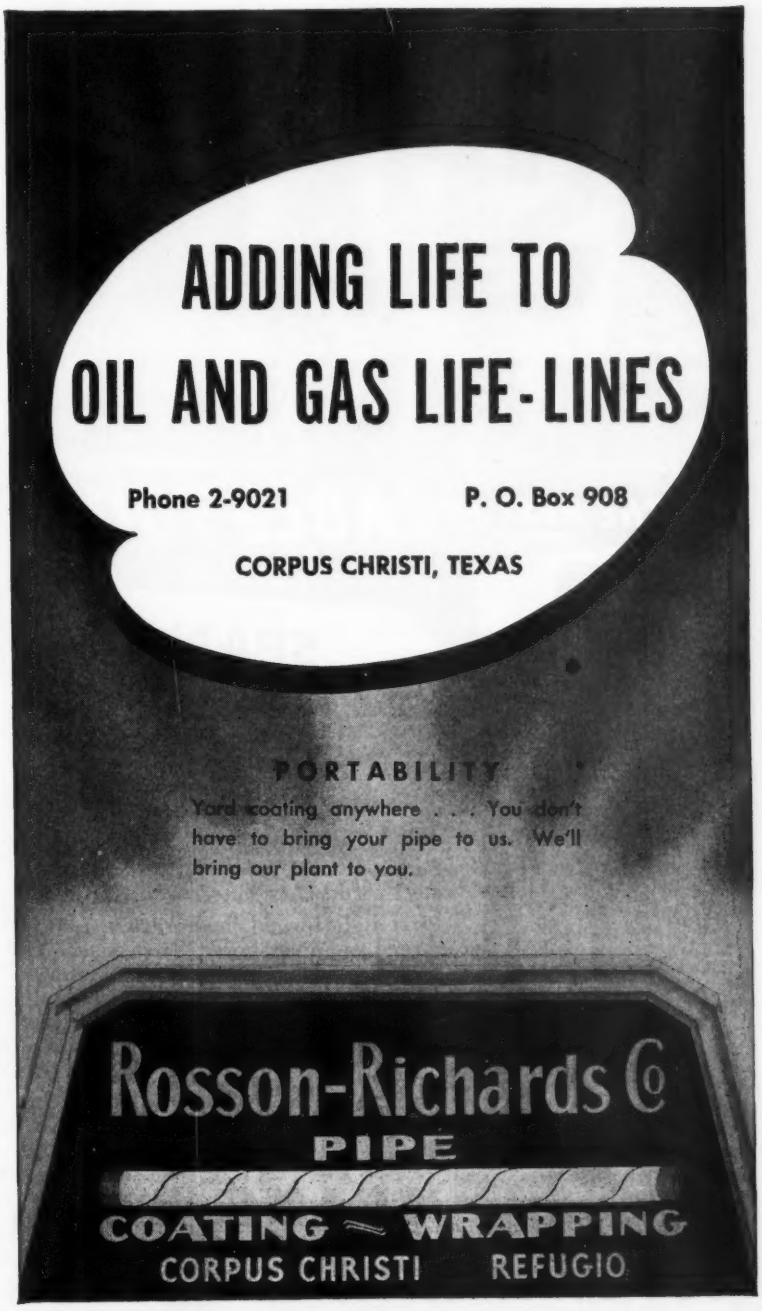
Kern County, McKittrick area: Pacific Western Oil Corp. A-84-30 Midway-McKittrick, 30-30s-22e, flowed 600 bbl. per day through 16/64-in. choke, gravity 35.3°, 0.4 per cent cut, perf. opposite Point of Rocks at 4,730-85 ft. and 4,800-45 ft., elev. 1,469 ft., TD 5,196 ft.

Los Angeles County, Inglewood area: Basin Oil Co. 1 City of Inglewood, 28-2s-14w, produced 250 bbl. daily through 6/64-in. choke, gravity 28.9°, 8.6 per cent cut, perf. opposite several intervals between 9,732 and 10,522 ft., elev. 120 ft., TD 10,590 ft.

CALIFORNIA WILDCAT FAILURES

Monterey County, San Ardo area: North American Cons. and Jergins Oil Co. 1 Rosenberg, 34-22s-10e, dry, elev. 500 ft., TD 2,500 ft.

Yolo County, Meridian area: Shell Oil Co., Inc. 1-1 Meridian Unit, 5-9n-1e, dry,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MICHIGAN

Total of 27 Completions Recorded for State

SAGINAW.—Michigan operations for the week resulted in 27 completions—11 oil producers, 3 gas wells, 13 dry holes. Of the new potential of 3,580 bbl. a day, 2,900 bbl. was from three more producers in Garfield of Newaygo County. Other small producers included one well in Allegan County, one in Barry, one in Bay, one in Missaukee, one in Montcalm, one in Van Buren, and two for 360 bbl. a day each in Claybanks of Oceana. Six of the seven wildcat completions were dry, the seventh being a small gas well in Ottawa County.

There were 26 new locations reported as follows: 4 in Oceana County, 3 in Bay, 3 in Clare, 6 in Newaygo, 2 in Allegan, 1 in Berrien, 2 in Saginaw, 1 in St. Clair, 1 in Muskegon, 1 in Isabella, 1 in Tuscola, and 1 in Ottawa.

MICHIGAN SUCCESSFUL WILDCAT

Ottawa County, Zeeland Township: Tri-County Development Co. 1 A. and A. Heyboer, C SW NE 13-5n-14w, gas well, 500,000 cu. ft., TD 996 ft.

MICHIGAN WILDCAT FAILURES

Kent County, Algoma Township: Socony Vacuum Oil Co., Inc., 1 C. L. Johnson, NE NE SE 8-9n-11w, dry in Traverse limestone, TD 2,377 ft.

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Fig. D312

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Lake County, Newkirk Township: C. E. Weller 1 State-Newkirk, SE SW SE 16-20n-12w, dry in Detroit River, TD 3,460 ft.

Mecosta County, Morton Township: Ohio Oil Co. 1 James E. Thurkow, C NW NW NE 19-14n-8w, dry in Detroit River, TD 3,701 ft.

Ogemaw County, Richland Township: J. O. Mutch 1 Donahue and Tawas Land Development, SE SW SE 29-21n-4e, dry in Antrim, TD 1,821 ft.

Ottawa County, Park Township: Wilma Lyons 1 Lena Dekker, SW SW SW 12-5n-16w, dry in Traverse limestone, TD 1,788 ft.

Jamestown Township: Sohio Petroleum Co. 1 Gerrit Baker, NW NE NE 22-5n-13w, dry in Traverse limestone, TD 1,855 ft.

SOUTHWEST TEXAS

Duval County Gets New Oil Pool

CORPUS CHRISTI.—A new oil pool has been opened 6 miles north of Benavides in Duval County by Gravis & Mitchell et al 1 Robert Schallert, which gaged 150 bbl. of oil per day on the pump through perforations at 1,770-85 ft. Total depth is 3,029 ft., and 5½-in. casing is set at 3,029 ft. This well is located in Survey 225.

Arnold O. Morgan Oil Co. opened a new shallow oil pay zone for West Sinton field of San Patricio County when it reworked the old Jones & Morgan 1 H. S. Smith dry hole, located 1½ miles northwest of Sinton townsite. It gaged 45 bbl. of oil per day plus 37½ per cent salt water, through a ¼-in. choke, with gas-oil ratio of 214. Production is through perforations at 1,490-95 ft., tubing pressure 60 psi., casing pressure 660 psi. Gravity of oil is 20.6°. The test was dry originally at 7,021 ft.

F. M. Boykin, Jr. 1 Hill-Jones Community lease, completed last January on the west flank of Midway field, San Patricio County, as a gas-condensate well, started making oil recently and has been retested and classified as an oil producer, in a new oil pay zone for the field. On production test it gaged 82 bbl. of 44.8°-gravity oil per day through a ⅛-in. choke, with gas-oil ratio of 2,440, tubing pressure 1,200 psi., casing 2,100 psi., making 20 per cent water, through perforations at 6,177-82 ft., top of sand 6,175 ft.

A new deeper pay has been opened at Bishop field, Nueces County, by H. R. Smith and W. C. McBride, Inc. 1 King Ranch, 990 ft. west of their 1 Kaiser discovery oil well 2 miles northwest of Bishop. On initial test it flowed 100 bbl. of oil per day through a 5/32-in. choke, through perforations at 7,400-38 ft. Tubing pressure was 250 psi., casing 500 psi. Total depth is 8,322 ft., with 5½-in. casing set to 7,900 ft. The discovery well was completed through perforations at 7,133-36 ft.

Humble Oil & Refining Co. 9 J. O. Phillips, deep test in Flour Bluff field of Nueces County, gaged 808,000 cu. ft. of gas and 16 bbl. of condensate per day through a ⅛-in. choke. Production is through perforations at 8,288-98 ft. in a new deep pay zone for the field.

The Texas Co.'s deep wildcat test in Willacy County, 6 Yturria Land & Livestock Co., has been temporarily abandoned after being unable to recover bit at total depth of 16,006 ft. This test is 8½ miles northeast of Raymondville, and is one of the deepest tests ever drilled in this area. The well tried to blow out at the 16,006-ft. depth, after operators had set 5½-in. liner to 14,940 ft. and drilled ahead to the 16,000-ft. depth. Operators fished for several weeks with no success; then set retainer and plugged temporarily.

SOUTHWEST TEXAS SUCCESSFUL WILDCATS

Duval County: New oil pool discovery—

THE NEW *Cameron* TRIPLEX FLOW WING

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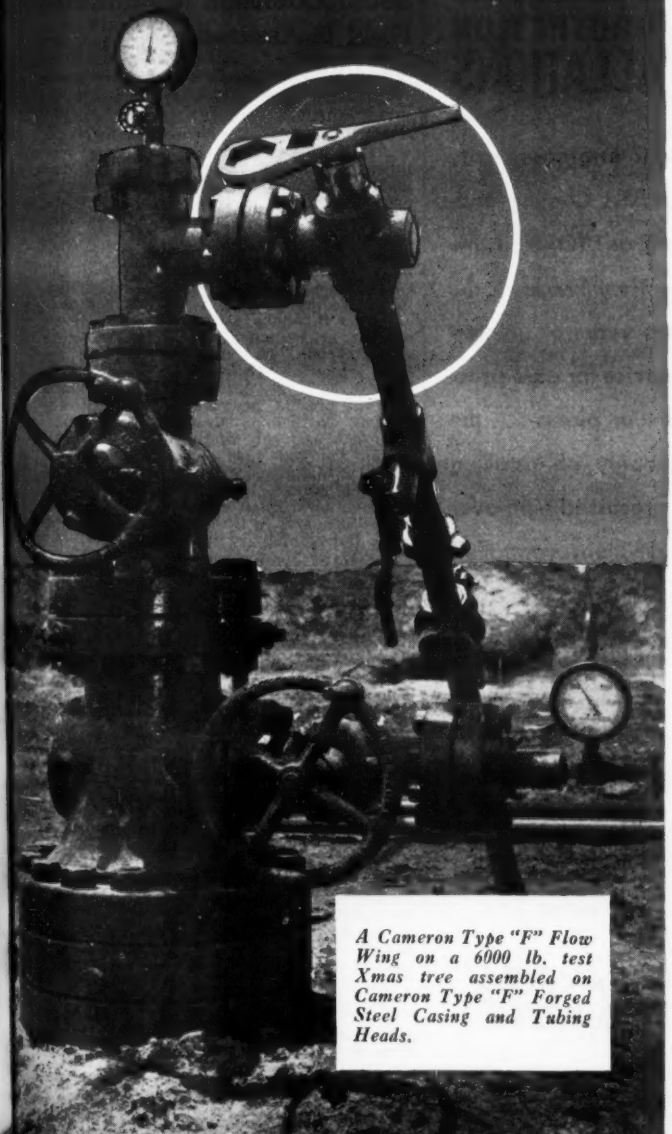
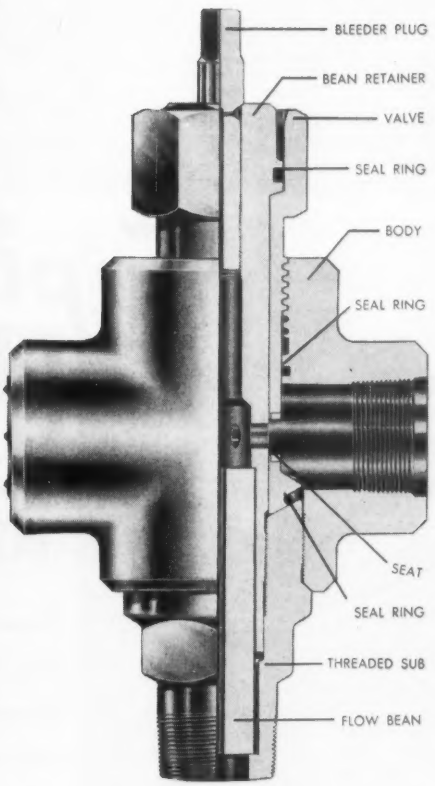


A Cameron Type "F" Flow Wing on a 6000 lb. test Xmas tree assembled on Cameron Type "F" Forged Steel Casing and Tubing Heads.



This latest model Cameron Christmas tree Flow-Wing serves a triple purpose: Within its overall length of *less than 16 inches* are combined all the units required to make up a flow-wing—a shut-off valve, positive choke, or adjustable choke.

Note in the accompanying cross-section view that essentially the same valve principle is used as in the earlier and higher pressure models. The stellite seat has proved highly satisfactory for withstanding abrasive flow and provides a dependable shut-off for choke changing. The valve is opened and closed by means of an all-purpose wrench (see picture at left).

The Flow-Wing may be fitted with a positive flow bean as illustrated, or with an adjustable choke, the latter interchanging with the pressure relief plug and bean. The all-purpose wrench is the only tool required for this operation.

To change positive beans you simply fit the wrench to the valve stem and close the valve, back out the bean retainer with the same wrench (the bean is retrieved with the retainer), replace the bean and reverse these operations. As a safety measure, the bean and its retainer cannot be removed until the valve is closed.

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XUM

Gravis & Mitchell et al 1 Robert Schallert, Sur. 255, 6 mi. N of Benavides on NW flank of Palangana salt dome, TD 3,029 ft., top sand 1,770 ft., perf. 1,770-85 ft., IP: 150 bbl. oil per day on pump, no water.

Jim Hogg County: New gas pay, East field Texas Co. 1 A. K. East, in Santo Domingo de Arriba, Antonio Ysaguirre Grant, TD 4,975 ft., top sand 3,955 ft., perf. 3,955-59 ft., IP: 9,000,000 cu. ft. gas per day open flow, TP (shut in) 1,430 psi., no water.

Medina County: New oil pool—John F. Camp & Sons 1 John F. Camp, in J. B. Zerr Sur. 48, in extreme SE corner of county and 3½ mi. SE of Devine, TD 2,250 ft., top sand (Navarro) 2,240 ft., perf. 2,240-50 ft., IP: 5 bbl. oil per day on pump test, shut in, 37° gravity. This well has been shut in.

San Patricio County: New oil pay Midway pool—F. M. Boykin, Jr. 1 Hill-Jones Communitized lease, Sec. 72, Geo. H. Paul's Subd. of CFP Co. lands (old well worked over). Original completion January 5, 1947, as gas-condensate well, but later started making oil and recompleted for oil well. TD 6,277 ft., top oil sand 6,175 ft., perf. 6,177-82 ft. IP: 82 bbl. oil per day through a ⅛-in. choke, gas-oil ratio 2,440, TP 1,200 psi., CP 2,100 psi., gravity 44.8°, 20 per cent water.

New oil pay West Sinton: Arnold O. Morgan Oil Co. 1 H. S. Smith, in Block 22, J. J. Welder and Coleman-Fulton Pasture Co. Subd., Jno. Pollam Sur., (old well worked over). Originally abandoned at TD of 7,021 ft. Top new sand 1,490 ft., perf. 1,490-95 ft., IP: 45 bbl. per day net oil through ¼-in. choke, gas-oil ratio 214, TP 60 psi., CP 660 psi., gravity 20.6°, 37½ per cent water.

SOUTHWEST TEXAS WILDCAT FAILURES

Guadalupe County: Weigand Well Servicing Co. 2 L. A. Anderson, in Harriet Cottle Sur., 2 mi. NW of Sullivan, dry, TD 2,060 ft.

Medina County: John F. Camp & Sons 2 John F. Camp, in J. B. Zerr Sur. 48, in extreme SE corner of county, dry, TD 2,620 ft.

Milam County: W. F. Glenn et al 1 Sulka, in Jose Leal Sur., 4½ mi. NE of Rockdale, dry, TD 740 ft.

Starr County: Baldridge & King et al 1 Mrs. O. H. Davenport-State, in CCSD&RGNG Sur. 532, 2½ mi. SE of Rincon field, dry, TD 5,135 ft.

C. G. Glasscock and Coastal Refg., Inc. 1 Sanchez, F. Gonzales Porcion 75, 4 mi. W of El Sauz, dry, TD 1,300 ft.

Williamson County: Stanley A. Thompson 1 W. B. Brewer, in Peter Cartwright Sur., 7 mi. SE of Taylor, dry, TD 1,279 ft.

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MISSISSIPPI

South Extension to Mallalieu Field Is Assured

JACKSON.—A 1½-mile south extension to Mallalieu field of Lincoln County, is assured at C. H. Osmond 1 Grady Jordan, 29-6n-8e. Pump is now being installed after well flowed approximately 2 bbl. per hour through a 13/64-in. choke after being shut in for 36 hours. Tubing pressure was 40 psi. Total depth is 10,564 ft., with 5½-in. casing set on bottom. Production is through perforations at 10,480-488 ft. The well is approximately 70 ft. lower than nearest producing wells 1½ miles north, but had stringer-sand development relatively high in the section to give it its first porosity about 70 ft. above water. Increased development at Mallalieu in the near future seems certain. Two new locations for the field, which are 4½ miles apart, are: Lion Oil Co. 1 T. E. Sutton, 13-6n-7e, 1 mile west of present production, and Crescent Drilling Co. 1 Luna Mae Minton, 14-6n-8e, is on the east side of the field.

Lion Oil has just completed its sixth well in Mallalieu field, Lincoln County. The new well, 1 Lucien, tested at 52 bbl. per hour on a small choke. A seventh well is drilling and will start two additional wells immediately in this area.

At Ovett, Jones County, Gulf Refining Co. 1 L. L. Majors, 29-6n-11w, is coring ahead below 13,120 ft. in dense sandy limestone. Last oil show was reported in core at 13,075-083 ft., the bottom 6 in. of 1 ft. 6 in. recovered was firm, porous, medium-grained sand with good odor and stain of light-brown oil. From coring time it is thought this sand may have a maximum thickness of 6 ft.

Also in Jones County, at Sandersville, Union Sulphur Co. 1 Earline Parker, 31-10n-10w, has pump installed and is now moving in and rigging up a workover rig to pull tubing and remove the production packer. Two miles south and ¼ mile east of 1 Parker, Union Sulphur 1 A. E. Fall Estate, 8-9n-10w, is drilling ahead below 6,000 ft., after coring in the City Bank and Christmas sand horizons. First cores, from 5,408-18 ft. recovered tight shaly sand with irregular oil stain, with a 4-ft. streak of fairly porous to porous saturated sand 5,410-14 ft. A drill-stem test 5,408-18 ft. recovered 30 ft. of oil and 45 ft. of oil-cut mud in 20 minues. Further cores, 5,418-5,434 had irregular oil stain 5,418-5,425 ft. in shaly sand and no show in sandy shale 5,425-5,434 ft. Second drill-stem test at 5,412-34 ft. recovered 90 ft.

of mud cut with heavy oil with no free oil or salt water. No shows were noted in the Christmas sand cores, with first porous sand noted at 5,717-23 ft. Operators plan to drill through the Massive sand and to run Schlumberger log.

MISSISSIPPI WILDCAT FAILURE

Warren County: Amerada Petroleum Corp. 1 State of Mississippi, C NW NE 16-16n-2e, dry, TD 4,425 ft. Schlumberger tops: Gas rock (sand) 3,622-50 ft., Volcanics 3,650-3,705 ft., Gas Rock 3,705-4,216 ft., Igneous 4,216-33 ft., Anhydrite 4,233 ft. end of log 4,240 ft.

FLORIDA WILDCAT FAILURES

Clay County: Humble Oil & Refg. Co. 1 Foremost Properties, Inc., NE SW 4-6s-25e, dry, TD 5,862 ft., elev. 120 ft.

Palm Beach County: Humble 1 Tuscon Corp., SW 35-43s-40e, dry, TD 13,375 ft.

OKLAHOMA

Nine Successful Drill-Stem Tests In East Lindsay Well

THE tenth drill-stem test in Sinclair Prairie 1 McDaniel, SE SE 35-5n-4w, McClain County, taken at 10,523-562 ft., using ¼-in. tool choke and ¾-in. surface choke, showed gas in 10 minutes which gaged 2,400,000 cu. ft. per day, and oil in 25 minutes. Flow of 43 bbl. of 44.3°-gravity oil was made the first hour. Nine of the 10 drill-stem tests starting at 10,100 ft. have recovered commercial oil shows and indicate some 460 ft. of pay. Cores were taken from 10,562-93 ft. and 10,593-627 ft., neither of which carried oil. Coring is being continued.

Carter Oil Co. 1 Bradshaw, NW SE 4-4n-3w, Garvin County, swabbed and flowed 15 bbl. oil per hour from Pennsylvanian with tubing at 7,125 ft. Total depth is 9,371 ft. Hole was plugged back to 7,215 ft. This test extends the East Lindsay pool 2½ miles east of the Bromide sand production in Section 6 and is 3¾ miles east of the Sinclair Prairie McDaniel well which extends the East Lindsay pool ¾ of a mile to the west.

Carter Oil Co. 1 Thompson-Combs, NW SE NE 15-2n-2w, Garvin County, had gas in 7 minutes, estimated at 4,000,000 cu. ft. per day, and oil in 23 minutes on drill-stem test at 6,525-6,605 ft. Oil was estimated at 10 bbl. per hour. Flow pressure was 2,500 psi. with bottom-hole pressure 3,000 psi. Top of Gibson was logged at 6,492 ft. Casing is being run. A successful completion will extend the northeast Elmore pool ½ mile to the west.

Superior Oil Co. of California 51-11 Weller, NW NW NE 11-8n-12w, Caddo County, the world's deepest well, is dry and abandoned at 17,823 ft. Several weeks have been spent in testing formations from 9,000 to total depth.

OKLAHOMA WILDCAT FAILURES

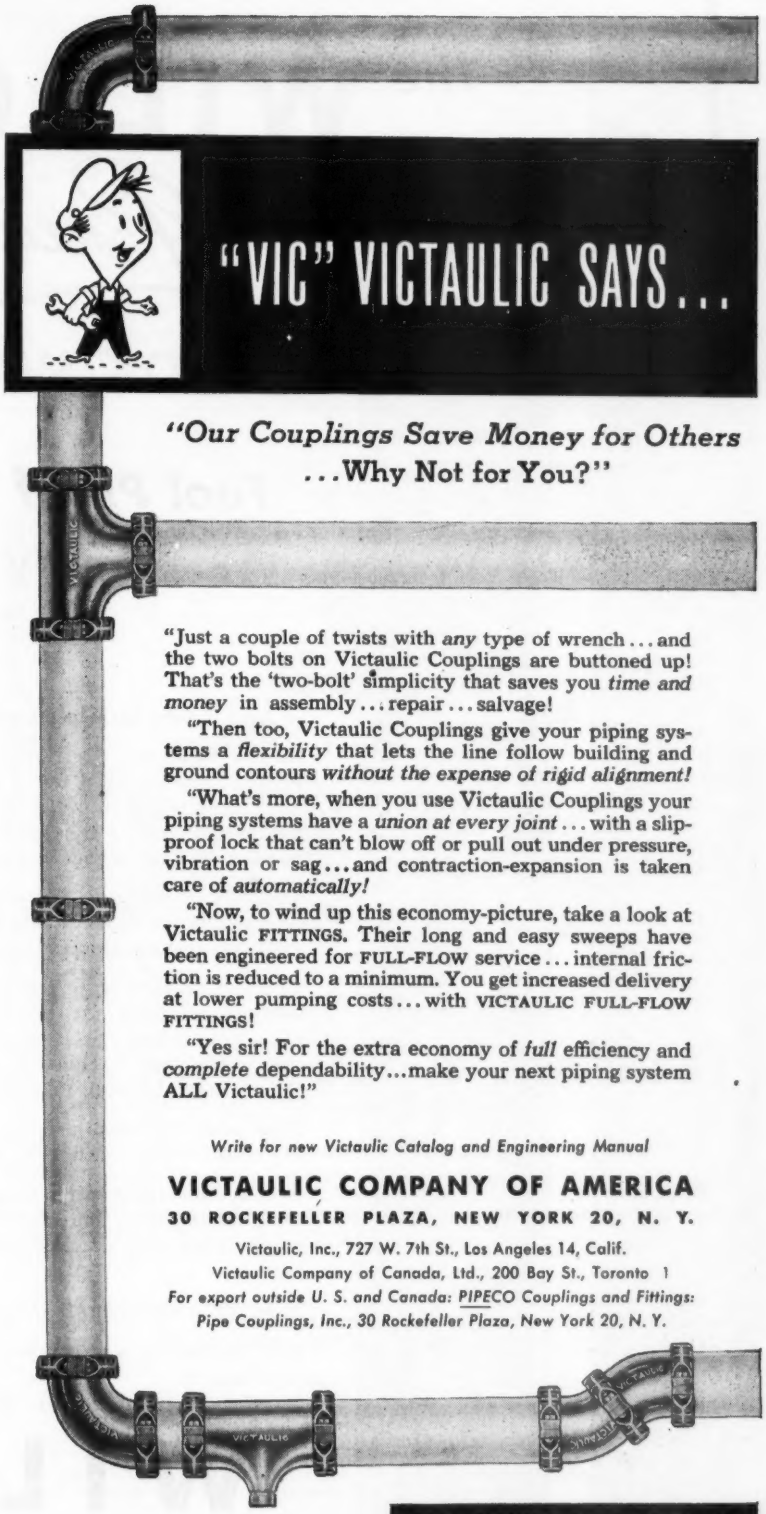
Cotton County: C. A. Johnson 1 F. E. Eason, NW NE NE 17-5s-12w, dry, TD 1,852 ft., lime 1,666 ft., sand 1,782-83 ft. and 1,785-1,827 ft., Megargle 1,827-40 ft., no shows.

Amerada Petroleum Corp. 1 Gina-Zuoe-Tone, NE NE SW 26-3s-12w, dry, TD 2,210 ft., sand 1,428-40 ft., 1,605-23 ft. and 1,878-1,906 ft., lime 1,941-52 ft., sand 2,007-21 ft., lime 2,042-52 ft., sand 2,052-58 ft., 2,135-40 ft., and 2,201-04 ft.

Creek County: H. A. Herrick 1 Yida M. Tull, SW NE NW 6-19n-7e, dry, TD 2,781 ft., Layton 1,800 ft., Perry 2,123 ft., Oswego 2,402-2,500 ft., Verdigris 2,570-83 ft., Skinner lime 2,630 ft., Skinner sand 2,630 ft., Red Fork 2,750-56 ft.

Garvin County: Gas & Oil Industries, Inc. 1 Ada Reynolds, SE SW SE 17-4n-3e, dry, TD 3,470 ft., sand 1,961 ft., Viola 2,810 ft., Bromide dense 3,095 ft., sand 3,352 ft., McLish lime 3,452 ft.

Lincoln County: Falcon Seaboard et al 1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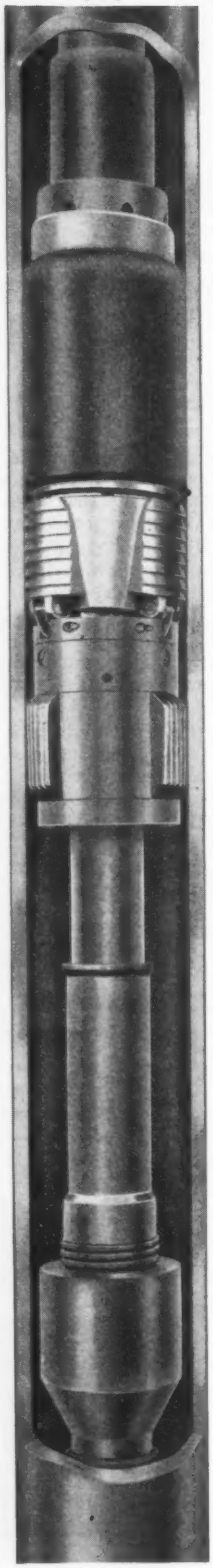

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Judkins, SE SE SW 30-14n-4e, dry, TD 5,140 ft., Dewey 2,500 ft., Hogshooter 2,865-97 ft., Layton 2,902-30 ft., Checkerboard 3,225-33 ft., Cleveland 3,244-54 ft., Oswego 3,915 ft., Cherokee 3,945 ft., Prue 3,964-4,007 ft., Skinner 4,097-4,145 ft., Mayes 4,605 ft., Hunton 4,860 ft., Sylvan 4,897 ft., Viola 4,985 ft., dense 5,015 ft., Wilcox 5,071 ft., second Wilcox 5,125 ft.

Pontotoc County: Sohio Oil Co. 1 McCoy, NE SE NW 13-4n-7e, dry, TD 4,370 ft., brown lime 1,635 ft., Booch 1,654 ft., Gilcrease 1,940-2,315 ft., Wapanucka 2,467 ft., Union Valley 2,690 ft., Cromwell sand 2,706-2,890 ft., Caney 3,272 ft., Mayes 3,415 ft., Woodford 3,526 ft., Hunton 3,645 ft., Chimneyhill 3,868 ft., Sylvan 3,943 ft., Viola 4,057 ft., dense 4,277 ft., sand 4,349 ft.

Pushmataha County: Joe Marshall 1 Gill, SW NW SW 20-4s-18e, dry, TD 343 ft., no tops reported.

Stephens County: Sohio Petroleum Co. 1 Wade, SW NW SE 10-1n-4w, dry, TD 4,305 ft. in shale, Pontotoc 3,970 ft., no shows.

KANSAS

Seward County Prospect Drilling In Mississippian

STANOLIND OIL & GAS CO. 1 Wheatley, NE NE SW 23-33s-31w, Seward County, a promising test about 15 miles east of the Hugoton gas field which recovered 2,690 ft. of 41°-gravity oil on drill-stem test at 5,099-5,117 ft. is drilling in Mississippi lime which was topped at 5,602 ft. Drill-stem tests in Mississippi lime have shown only small volumes of gas. Top of Lansing was logged at 4,314 ft. and Morrow at 5,552 ft.

Stanolind Oil & Gas Co. 1 Repp, NE NE NW 29-28s-17w, Kiowa County, is being plugged back to test Mississippi lime where drill-stem test at 4,842-52 ft. showed 2,820,000 cu. ft. gas per day through ¼-in. choke. The well tested the Arbuckle which yielded only salt water on drill-stem test. Mississippi was logged at 4,842 ft., Viola at 4,960 ft., Simpson at 5,088 ft., and Arbuckle at 5,147 ft.

Gulf Oil Corp. 1 Lorimer, SE SW 36-31s-20w, Comanche County, a rank wildcat about 7 miles northwest of Coldwater, found Mississippi at 5,191 ft. A 6-ft. core from 5,198-5,204 ft. showed light oil stains and trace of gas. Coring is continuing at 5,210 ft.

Harber Drilling Co. et al. have set pipe on top of Arbuckle at 3,633 ft. in 1 Baumgarten, NE NE NE 25-9s-19w, Rooks County, after getting good oil show in top 3 ft. of Arbuckle. Total depth is 3,636 ft. The test is 2¼ miles southwest of Paradise Creek pool.

KANSAS SUCCESSFUL WILDCAT

McPherson County: Mallard Drilling et al 1 Hoffsommer, NW NW SE 6-18s-1w, pumped 215 bbl. of oil per day from Mississippi lime at 2,752-72 ft., no other tops reported, TD 2,800 ft.

KANSAS WILDCAT FAILURES

Barton County: Barbara Oil & Beardmore 1 Zorn, SW NW SW 18-16s-12w, dry, TD 3,467 ft., anhydrite 350 ft., Topeka 2,747 ft., Lansing-Kansas City 3,123 ft., conglomerate 3,404 ft., Arbuckle 3,437 ft.

Butler County: Rex & Morris and E. H. Adair 1 Rice, SE SW NW 4-26s-4e, dry, TD 2,560 ft., Lansing 1,770 ft., Kansas City 2,050 ft., Mississippi lime 2,427 ft.

Comanche County: J. M. Huber Corp. 1 Ferrin, C NW NE 10-31s-17w, dry, TD 5,595 ft., anhydrite 970 ft., lime 4,056 ft., Lansing-Kansas City 4,301 ft., Mississippi lime 4,986 ft., Viola 5,267 ft., Simpson shale 5,462 ft., Simpson dolomite 5,486 ft., Arbuckle 5,566 ft.

Cowley County: H. H. Blair 1 Root, NE NE NW 31-30s-4e, dry, TD 2,944 ft., Kansas City 2,310 ft., Mississippian 2,927 ft.

Graham County: Skelly Oil Co. 1 Fred Andregg, NW NW SW 31-8s-21w, dry, TD 3,766 ft., anhydrite 1,672 ft., Heebner 3,351 ft., Lansing-Kansas City 3,384 ft., conglomerate 3,705 ft., Arbuckle 3,741 ft.

Anderson-Pritchard & Texon 1 Lloyd, NW NW SW 33-9s-22w, dry, TD 4,117 ft., anhydrite 1,255 ft., Lansing-Kansas City 3,608 ft., Arbuckle 4,020 ft.

Marion County: Hutchinson Oil & Gas Co. 1 Ray Stancel, SW SW NW 29-19s-4e, dry, TD 3,610 ft., Mississippian 2,290 ft., Viola 2,577 ft.

Rice County: Doley Oil Co. et al 1 Colle, SE SE SE 34-20s-7w, dry, TD 3,391 ft., conglomerate 3,341 ft., Mississippian 3,346 ft.

Rooks County: Atlantic Refining 1 Ruzicka, NE NE SW 17-9s-18w, dry, TD 3,582 ft., anhydrite 1,500 ft., Lansing-Kansas City 3,307 ft., Arbuckle 3,550 ft.

Aylward Production 1 Joy, SW SW NE 4-10s-19w, dry, TD 3,758 ft., anhydrite 1,575 ft., Topeka 3,170 ft., Heebner 3,350 ft., Lansing-Kansas City 3,404 ft., Basal Kansas City 3,570 ft., cherty conglomerate 3,673 ft., Simpson 3,723 ft., Arbuckle 3,745 ft.

Palmer Oil Co. 1 Darland, NW NE NW 11-10s-17w, dry, TD 3,510 ft., Lansing-Kansas City 3,175 ft., Arbuckle 3,460 ft.

Saline County: Lowell Drilling et al 1 Maneval, SW SW SW 12-13s-2w, dry, TD 3,359 ft., Mississippian 2,579 ft., chert 2,626 ft., Viola 3,195 ft., Simpson dolomite 3,289 ft.

Sumner County: El Dorado Refining 1 Botkin, SW SW SE 13-31s-2w, dry, TD 3,824 ft., Kansas City 3,118 ft., Mississippian 3,772 ft.

MISSOURI WILDCAT FAILURE

New Madrid County: U. S. Bureau of Mines

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1 R. B. Oliver, Jr., SW SW SW 29-22n-11e, dry, TD 3,604 ft., no tops reported.

APPALACHIAN FIELD

Onondaga Chert at 8,008 Ft. In Fayette Co. Wildcat

PITTSBURGH. — On Chestnut Ridge in Springhill Township, Fayette County, southwest Pennsylvania, Manufacturers Light & Heat Co. topped the Onondaga chert at 8,008 ft. in the wildcat on George Steve tract with about 4,000 cu. ft. of gas showing at 8,052 ft. or the first gas show in the formation. Strung out from Wymps Gap a mile north of the West Virginia state line to the Barton lease, five other wildcats are drilling and a rig standing for another test of the Barton.

In Poca district, Kanawha County, West Virginia, Columbian Carbon Co. completed another fair oil well in the local pool with 3B H. H. Parsons good for 50 bbl. and 25,000 cu. ft. of gas. In this district, Leatherwood Oil & Gas Co. completed 2 Laura M. Flowers good for 1,500,000 cu. ft. gas. Both are producing from the Big lime at 1,971 ft. and 1,830 ft., respectively.

WEST VIRGINIA SUCCESSFUL WILDCAT

Nicholas County, Jefferson district—Columbian Carbon Co. 953 Abney Payne, 1,348,000 cu. ft. gas; Maxton sand 1,596 ft., gas 1,622-24 ft., rock pressure 380 psi. 14 hours, TD 1,625 ft.

WEST VIRGINIA UNSUCCESSFUL WILDCAT

Greenbrier County, Williamsburg district: Texas Co. 1 G. R. Dean, dry, elev. 2,575 ft., Corniferous chert 6,431 ft., Oriskany 6,538-72 ft., Williamsport 7,458-7,550 ft., Tuscarora 7,988-8,120 ft., TD 8,120 ft. Drill-stem test gaged 103,000 cu. ft. gas

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ILLINOIS

Sailor Springs Pool Well Flows 1,012 Bbl. In 27 Hours

MATTOON.—H. F. Robinson 2 Kneff, SE SW SE 16-3n-7e, Clay County, flowed 60 bbl. oil the first hour when plug was drilled and flowed 1,012 bbl. in 27 hours from McClosky lime at 2,958-64 ft. Total depth is 3,029 ft. The well is on the southwest side of Sailor Springs Consolidated pool and is apparently the best well in the area.

On the northeast end of the Rural Hill pool, in Hamilton County, Calstar Petroleum Co. 1 Hughes, SW SW NW 5-6s-6e, swabbed and flowed 410 bbl. oil after 60-qt. shot in Aux Vases at 3,113-33 ft. Total depth is 3,313 ft.

About 4 miles from the Mississippi River in southwestern Jersey County, cable tools are below 1,579 ft. in T. R. Kerwin 1 Legate, SE SW SE 2-6n-13w.

Gilliam Drilling Co. 1 Hines, NW NW SW 36-5s-10e, White County, on drill-stem test at 2,809-25 ft. recovered gas, 50 ft. oil, 60 ft. oil-cut mud and no water. Total depth is 3,050 ft. Operators are running pipe to test.

Ben Taylor 1 Sebastian, NW NE SW 21-1n-2e, Marion County, is pump-testing Benoist at 1,917-31 ft. Well made 10 bbl. oil and 40 bbl. water.

ILLINOIS SUCCESSFUL WILDCATS

Clinton County: Fawley and Jackson 1 Burkett, SW NW SW 5-3n-2w, 5 bbl. nat., TD 1,152, Paint Creek 1,080 ft., Benoist 1,144 ft., pay 1,147-49 ft. in Benoist.

ILLINOIS WILDCAT FAILURES

Clay County: Tully and Carter 1 Wood, NE SW NE 17-4n-7e, dry at 3,025 ft., Barlow 2,609 ft., Aux Vases 2,874 ft., Ste. Genevieve 2,930 ft., McClosky 2,980 ft.

Clinton County: C. R. Winn et al. 1 Huber, NW SW SE 36-3n-1w, dry at 1,526 ft., Glen Dean 1,202 ft., Barlow 1,360 ft., Benoist 1,520 ft.

Edwards County: Burr Lambert 2 Soucy, NE SW SE 21-1n-10e, dry at 3,356 ft., Glen Dean 2,661 ft., Barlow 2,863 ft., Ste. Genevieve 3,244 ft., Rosiclare 3,259 ft.

Jasper County: National Associated Oil Co. 1 Bohann, SW SE SW 5-6n-8e, dry at 3,120 ft., Glen Dean 2,463 ft., Barlow 2,600 ft., Ste. Genevieve 2,941 ft., McClosky 2,993 ft.

Jefferson County: B. W. Vinson 1 Collier, NW NW NW 21-3s-3e, dry at 2,892 ft., Glen Dean 2,240 ft., Ste. Genevieve 2,767 ft., Fredonia 2,839 ft., McClosky 2,846 ft.

Lawrence County: Gerasimos 1 Kelley, NE SE SE 36-4n-12w, dry at 1,926 ft., Cypress 1,628 ft., Aux Vases 1,811 ft., Ste. Genevieve 1,842 ft., McClosky 1,889 ft.

Madison County: Joe Kesl Jr. 1 Kusmanoff, SW SE 12-3n-9w, dry at 1,687 ft., Ste. Genevieve 1,385 ft., Maquoketa 1,472 ft., Trenton 1,617 ft.

Saline County: H. E. Howard 1 Anna Cole, NE NE SE 20-7s-6e, dry at 3,262 ft., Barlow 2,717 ft., Cypress 2,770 ft., Benoist 2,900 ft., Aux Vases 2,998 ft., Rosiclare 3,095 ft.

Shelby County: National Associated Oil Co. 1 Shumard Community, NE NE NW 3-9n-5e, dry at 2,186 ft., Ste. Genevieve 2,030 ft., Rosiclare 2,043 ft., Fredonia 2,077 ft.

Wabash County: Emily Holt 1 Odell, NW NE SW 3-2s-14w, dry at 3,102 ft., Glen Dean 2,428 ft., Barlow 2,651 ft., Ste. Genevieve 2,970 ft., St. Louis 3,087 ft.

Wayne County: Dan Slope 1 Callan, SE NW SW 20-2n-9e, dry at 3,190 ft., Glen Dean 2,506 ft., Cypress 2,739 ft., Rosiclare 3,094 ft., Fredonia 3,112 ft.

White County: Indiana Farm Bureau et al.

1 Williams-Schoeman, NE NE SE 36-5s-9e, dry at 3,175 ft., Cypress 2,754 ft., Paint Creek 2,848 ft., Aux Vases 2,990 ft., McClosky 3,058 ft.

LA.-ARK.

Testing Continues at Natchitoches Test

SHREVEPORT.—H. C. Cockburn 1 L.L.L.L. Co., prospective discovery in 11-8n-8w, Natchitoches Parish, continued testing, with total depth at 6,628 ft. in the Glen Rose. A drill-stem test of perforations at 6,540-50 ft., open 2 hours and 15 minutes, produced no pressure but flowed gas and salt water. The next test, at 6,605-11 ft., open 15 minutes, produced a slight blow for 10 minutes, then died. Recovery was 150 ft. of mud. A test of perforations at 6,614-19 ft., open 2 hours, produced a slight blow for 50 minutes, then flowed salt water. Operators were to squeeze all perforations.

In Red River Parish, 4½ miles west of Coushatta, Union Producing Co. 1 Anna Campbell, 20-12n-10w, had total depth at 7,090 ft. and was reaming down. A 10-minute drill-stem test at 6,806-75 ft. recovered mud; a second test at 6,914-68 ft. ended in failure of the packer. A 24-minute test at 6,920-90 ft. produced no pressure, and recovery was 20 ft. of mud, and the last reported test at 6,984-7,090 ft. failed when the packer again gave way. Top on the Travis Peak was called at 6,700 ft., by samples.

Union Producing and Pure Oil Co. 1 Frazier, 14-14n-6w, Bienville Parish, made a test at 6,758-6,806 ft., which made a blow of air, with no pressure, and recovered only 7 ft. of mud. Top on the James limestone was logged at 7,620 ft., with porosity at 7,633-43 ft. Two miles northeast of Bienville, in 25-16n-9w, The Texas Co. 1 W. A. Givens was drilling below 4,752 ft. Sample top on the Glen Rose was 3,185 ft., and the upper anhydrite stringer at 4,543 ft.

Southeast of Sicily-Island, Catahoula Parish, Pan American Producing Co. 1 L. R. McGraw, 24-10n-8e, had total depth in salt at 6,265 ft. Cored at 5-ft. intervals between 6,125-6,225 ft., recovered sand at 6,225 ft. Between 6,140-50 ft. the recovery was 2 in. of green, fine-grained sand, having a slight show of oil. Operators shut down to await further orders.

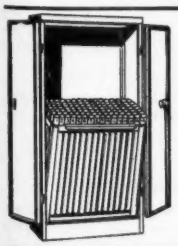
NORTH LOUISIANA WILDCAT FAILURES

Franklin Parish: C. H. Murphy and Sun Oil Co. 4 J. E. Holt, NW NE 21-16n-8e, dry, TD 4,520 ft., no details available.

Richland Parish: George B. Franklin 2 fee, SE NW 28-18n-8e, dry, TD 3,024 ft., no details available.

ARKANSAS WILDCAT FAILURE

Calhoun County: Jack Carnes 1 Gaughan,



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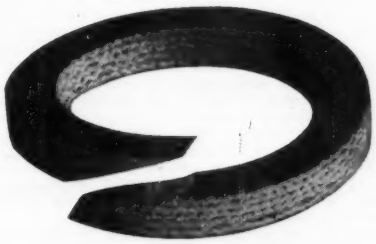

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PERMIAN BASIN

Reeves County Test Reports 25-Bbl. Flow

MIDLAND. — Reeves County again was in the oil picture when Texzona Producing Co. of Fort Worth 1 Tunstill, 6 miles northeast of Orla, in the northwestern corner of the county, reported a flow of 25 bbl. of fluid in 2 hours. The fluid was said to have tested 90 per cent oil and the balance drilling mud and load water. Earlier reports of a flow at the rate of 125 bbl. of oil an hour were unconfirmed.

The 2-hour flow, natural, was through open 2-in. tubing set at 3,290 ft., and gravity of the oil was estimated at 36.5°. Total depth was 3,308 ft., and top of the Delaware sand pay section was 3,275 ft. The well had been shut in 4 hours, during which time casing pressure built up to 450 lb. At the end of the 2-hour flow it had dropped to 350 lb. Operators shut the well in while it was still flowing.

On last report, a control head and separators were to be installed and a completion potential was expected to be made by week's end. Observers estimated the well to be good for 100-150 bbl. of oil a day, in the event water is not encountered. So far, no water in the sand has been found. Water produced during the flow was load water.

While drilling at 3,285 ft., the 1 Tunstill unloaded, making some oil and gas estimated at 2,000,000 cu. ft. a day. The flow was killed with water and drilling continued to 3,298 ft., when the hole again unloaded an estimated 125 bbl. of fluid in 90 minutes. The well was again killed and drilling continued to 3,308 ft. Efforts to revive the flow, by swabbing, were unsuccessful and operators shut the well in to increase pressure.

Location of the wildcat is 330 ft. from the north and east lines of Section 10, Block 56, TP Survey. Nearest production is Mason (Delaware) field in Loving County, about 6 miles northeast of the 1 Tunstill.

Byrd-Frost, Inc. 1 J. B. Mayberry, prospective discovery in northwestern Crockett County, had deepened from 6,345-6,376 ft. and was preparing a second drill-stem test. The first test, at 6,295-6,345 ft., brought gas to the surface in 10 minutes, estimated from 5,000,000 to 10,000,000 cu. ft. a day, and recovered 200 ft. of oil and 100 ft. of gas-cut drilling mud. Location of the well is 6 miles southwest of Crockett field and 1⅞ miles northeast of the Pecos River in Section 39, Block 31, H&TC Survey.

Humble 1 Mitcham, northeastern Crockett County Ellenburger discovery, 14 miles northeast of Ozona, was to be completed with acid, according to last reports. Early in the week the well flowed, naturally, 210 bbl. of oil in 22 hours, through ¾-in. choke. Another test, through ¼-in. choke, it flowed 11.25 bbl. of 41°-gravity oil in 1 hour. Gas-oil ratio during the 1-hour test was 1,255 to 1, and flowing pressure was 180 lb. Production is from perforations at 8,092-8,105, and 8,112-22 ft. Humble staked a diagonal northeast offset to the discovery, which will be the 1 Ethel C. Smith Estate, Section 1, G. B. Crouch Survey. It will be drilled to 8,200 ft.

WEST TEXAS SUCCESSFUL WILDCATS

Crockett County, discovery of Clara Couch Wolfcamp: Cities Service, Humble and Plymouth Oil Co. 1-B J. W. Owens, Sec. 6, Blk. CG, 1½ mi. S Olson field, flowed 597 bbl. 39.4°-gravity oil a day through ¼-in. choke, top Wolfcamp pay 5,668 ft., TD 8,264 ft., PB 5,685 ft., tubing pressure 450 lb., gas-oil ratio 1,970:1, perforations 5,670-75 ft., elevation 2,410 ft.

Sinclair Pairie and Atlantic 1-66 University, Sec. 30, Blk. 46, University Lands, 8 mi. NE Todd Deep field, flowed 1,311 bbl. 49°-gravity oil a day through ½-in. choke, top Ellenburger pay 7,530 ft., TD 7,680 ft., gas-oil ratio 2,650:1, casing pressure 2,000 lb., tubing pressure 1,350 lb., elevation 2,680 ft.

WEST TEXAS WILDCAT FAILURES

Concho County: B. H. Nolen et al 1 J. W. Barr, F. J. McCarthy Sur. 2, A-1,445 ft. 3 mi. S Leaday, dry, TD 3,337 ft., Canyon 1,570 ft., Strawn 2,380 ft., Ellenburger 3,046 ft., by samples, elevation 1,554 ft.

Crockett County: C. E. Hyde et al 1 Bury C. Helbing, Sec. 16, Blk. QR, TTRR Sur., 6 mi. SW Ozona, dry, TD 9,000 ft., Ellenburger 8,600 ft., elevation 2,488 ft.

Howard County: Stanolind Oil & Gas Co. 1 T, H. Gaskins, Sec. 7, Blk. 33, T&P Sur., 8 mi. SW Big Spring, dry, TD 10,366 ft., Yates 1,750 ft., Clear Fork 4,960 ft., Leonard sand 6,210 ft., Ellenburger 10,315 ft., by sample elevation 2,555 ft.

Sutton County: H. L. Hunt 1 Bundy, A. Gray Sur., SE corner of county, dry, TD 4,800 ft., Ellenburger 4,450 ft., elevation 2,286 ft.

SOUTHEASTERN NEW MEXICO

HOBBS.—Cole-Darden Oil Co. 1 Phillips-States, 30-17s-34e, west central Lea County wildcat, was drilling ahead below 3,475 ft. in limestone and reported running high on structure on an elevation of 4,089 ft.; top of the Yates was 2,810 ft. This was correlated about 75 ft. high on that formation to Devonian Oil Co. 1 State, about 1 mile to the southwest. Several shows and some free oil were reported in the Devonian test.

Phillips Petroleum Co. 2 Sims, 24-22s-37e, southeast flank well to the Drinkard area

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Altimeters

of Lea County, was drilling ahead below 6,867 ft. in Lower Permian limestone after flowing some 10 bbl. of oil an hour natural on a drill-stem test from 6,320-6,420 ft. A second test at 6,630-6,703 ft. open 1 hour recovered 180 ft. of gas-cut drilling mud.

SOUTHEAST NEW MEXICO WILDCAT FAILURE

Chaves County: De Kalb Agriculture Ass'n. 2 Mary N. Cannon, NE SW 27-10s-25e. dry, TD 1,014 ft.

CANADIAN FIELDS

Leduc Gets Seventh Consecutive Producer

CHATHAM.—In Leduc field, Imperial Oil is finishing its seventh consecutive producer. Imperial 7, LSD 4, 15-50-26w4, finished at 5,397 ft. with flush of 204 bbl. in 6 hours. Put on ⅛-in. choke it shut off production, necessitating blowing down and cleaning. It is expected to rate with the larger producers. Imperial 6, LSD 1, 22-50-6w4, finished at 5,359 ft. is testing with good production indicated. Imperial 5, LSD 8, 21-50-5w4, finished at 5,100 ft., has initial production of 76 bbl. with 26,000 cu. ft. gas through ⅛-in. choke. Imperial 8, LSD 7, 26-50-26w4, was last reported in the first porous zone below 4,987 ft. Imperial has three other tests drilling and one location.

Okalta Leduc 1, LSD 13, 7-50-25w4, outpost test 2 miles southeast of production, is deepening below 5,288 ft. after getting water in the first porous zone. Globe-Leduc West 2, LSD 9, 34-50-26w4, a mile northwest of Imperial 3 producer, cored into the top of the D-3 zone at 5,200 ft., drill-stem test at 5,200-15 ft. showing heavy gas flow. A further 10 ft. is testing with the main producing horizon of Imperial 3 expected around 5,275 ft.

B. A. Pyrcz 1, LSD 12, 25-50-26w4, ½ mile east of Imperial 3, broke through an unusually thick green shale section into porosity at 5,327 ft., the next 20 ft. showing dolomite with some porosity and traces of oil. Hole is reaming for drill-stem test at 5,310-47 ft. Leduc Consolidated 1, LSD 10, 23-50-26w4, is below 4,932 ft. and nearing D-2 zone. Five other independent tests are drilling and one standing, with four locations.

South of the field, McColl - Frontenac East Wetaskiwin, LSD 3, 22-46-23w4, was dry at 5,368 ft. McColl-Frontenac Wizard Lake, LSD 14, 14-48-27w4, is coring below 5,671 ft. McColl-Frontenac Bigstone Creek, LSD 1, 20-46-26w4, is coring below 5,739 ft.

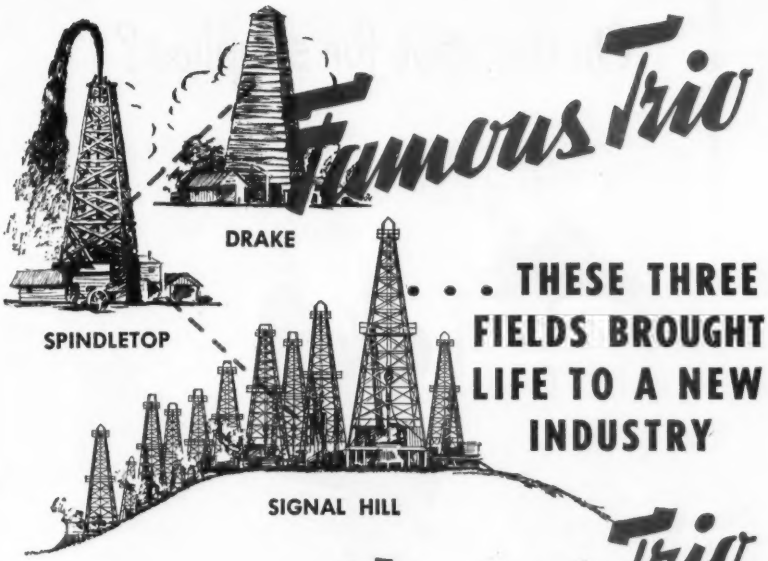
Unlike Turner Valley, Leduc field lacks surplus gas. Gas sufficient for drilling fuel is encountered in the Viking sand, but the Devonian limestone has just enough to flow the oil.

Northern Alberta.—In the Edmonton area, Imperial is well advanced with a string of tests outlying Leduc field in various directions. East of the field, Imperial-Looma 1, LSD 4, 10-50-23w4, is below 6,217 ft. North and east, Imperial-Morinville 1, LSD 9, 30-56-24w4, is deepening below 4,806 ft., after encountering some gas. West and south, Imperial-Battle Lake 1, LSD 16, 12-46-3w5, is below 5,327 ft.

Still farther northwest, Imperial-Paddle River 1, LSD 5, 17-56-28w5, encountered gas and traces of oil followed by salt water in a drill-stem test of Devonian limestone at 5,249-61 ft. and is deepening. Most northerly and westerly test of the wildcat group, Muskeg 1, SE 24-57-6w6, is below 5,385 ft.

Turner Valley.—In North Turner Valley, Home Oil 25, LSD 3, 33-20-3w5, with Madison at 8,175-8,756 ft., flowed 661 bbl. after acidizing. Home Oil has 4 other tests drilling, and Home 26 testing.

Lloydminster.—In Lloydminster field, June production set a new record, with 72,979 bbl. from 77 wells, or an average of 31½ bbl. daily per well. For the 6 months of 1947, Saskatchewan with 45 produc livered 164,855 bbl., while Alberta with 32



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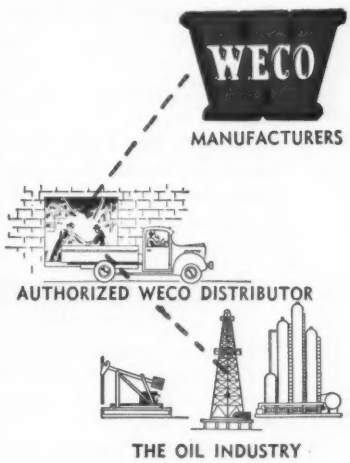

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1927— 20TH YEAR OF GETTING THERE FIRST! — 1947

wells produced 79,222 bbl. Production shows a gain of 176,713 bbl. over the corresponding 6-month period of 1946. The field consists of three different areas, the Blackfoot section to the northwest, in Alberta; Lloydminster field proper, in both Alberta and Saskatchewan; and the Lone Rock area to the southeast, in Saskatchewan. June production showed, for the Blackfoot section, 15 wells with 17,124 bbl.; the Alberta portion of the main field, 19 producers with 8,348 bbl.; the Saskatchewan portion, 34 wells with 38,524 bbl., and the Lone Rock area, 9 wells with 8,982 bbl.

OHIO, KENTUCKY

Gas Pool Extension Finds Unexpected Oil

COLUMBUS. — Considerable speculation has been aroused by a possible oil discovery in Lawrence County. A west extension to Symmes gas pool being drilled by Ohio Fuel Gas Co. on Carl Moulton tract in Section 13, Decatur Township, unexpectedly ran into oil at 7 ft. in the Niagara lime. Flowing by heads every 2 hours, the well was estimated to have made from 200 to 250 bbl. in 24 hours. In 5 days the flow had declined considerably and the well was deepened 2½ ft. The well is now being swabbed in an attempt to exhaust water which may be coming in from the Cinnamon or from the oil sand.

John Morrow 2 C. A. Crossan, Section 27, Madison Township, Perry County, flowed 256 bbl. in 24 hours after shot, the largest initial production in Sego pool. Preston Oil Co. has staked a south offset on the R. B. Hurst et al. tract.

H. B. Walker 3 Nelson-Smith, Section 2, Bedford Township, Meigs County, came in with a good oil showing natural, and after shot made 48 bbl. the first day.

Salem Petroleum Products Co. 2 Charles W. Tipton, Section 6, Brush Creek Township, Muskingum County, ½ mile northwest of well No. 1, came in at 497,000 cu. ft. of gas natural and 1,220,000 cu. ft. when shut in after shot. Rock pressure was reported as 1,130 psi.

William Pfeiffer has moved ½ mile west of his big gas well on Samuel Nofsinger to stake a location on Thomas Stringfellow in Section 6, Bethlehem Township, Stark County. Thirty-three other locations were reported with six each in Perry and Muskingum counties, five in Monroe, and four in Stark. Brush Creek led in completions with 6 out of 27.

WESTERN KENTUCKY

OWENSBORO.—O. O. Borden 1 Whitefield, SE SE 1-K-25, Hopkins County, a rank wildcat about 6 miles northeast of Madisonville, has been put on pump to test Tar Springs at 2,300-20 ft. Total depth is 2,967 ft.

George S. Engle 1 J. H. Williams, 25-M-25, Webster County, bailed 7 bbl. oil per day from Benoist at 2,958-82 ft. Well is being cleaned out after shooting Benoist with 40 qt. McClosky at 3,170-96 ft. testing dry after being acidized.

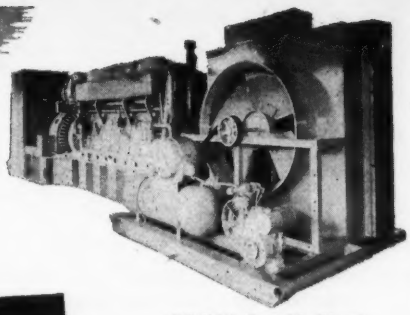
C. D. Burbank 1 C. D. Burbank, 22-R-23, Henderson County, across the Ohio River from Evansville, Ind., is drilling at about 1,600 ft.

WESTERN KENTUCKY WILDCAT FAILURE

Union County: C. E. O'Neal et al. 1 Ed Culver, 9-P-20, dry at 2,750 ft., Viola 1,860 ft., Tar Springs 1,898 ft., Cypress 2,252 ft., Ste. Genevieve 2,546 ft.

EASTERN KENTUCKY

ASHLAND.—One of the biggest producers in months was completed on the Grover Runyon property in Pike County during the past week by Kentucky-West



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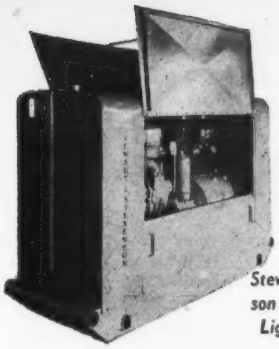

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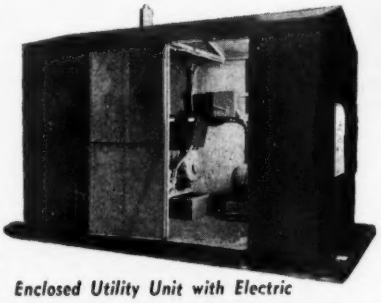

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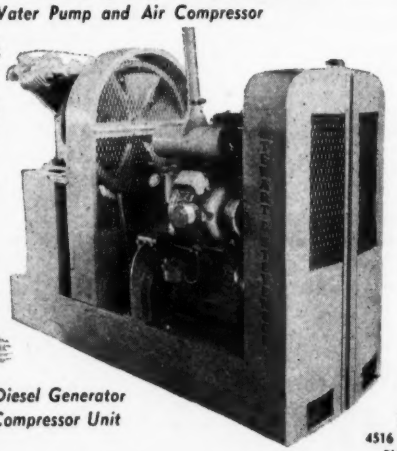

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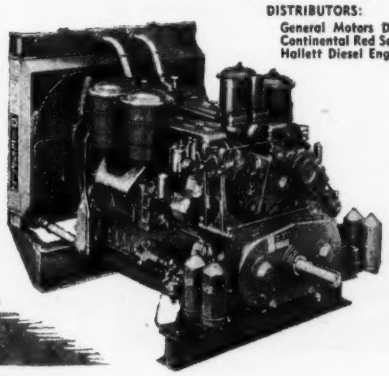

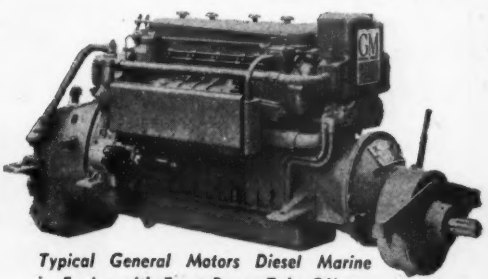

Typical General Motors Diesel Marine Engine with Front Power Take-Off

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Virginia Gas Co. The well, No. 846, finished at 2,018 ft., with 2,711,000 cu. ft. of gas in Big lime.

The same company also completed five other gassers and two dry holes over this area of the state.

INDIANA

EVANSVILLE.—Buckman-O'Neal 1 Wendell Wassmer, NE SW SW 6-6s-11w, Vanderburgh County, has pipe set to test saturation in Cypress sand at 2,286-96 ft. Total depth is 2,301 ft. Drill-stem test recovered 30 ft. oil, 30 ft. mud-cut oil, 30 ft. mud, and no water. This test is about 1½ miles northeast of production in St. Wendells pool and if found commercial will give this immediate area its first Cypress sand production.

Gulf Oil Corp. 1 Mackey, NW NE SE 9-8s-14w, Posey County, is pump testing McClosky at 2,648-52 ft. and 2,698-2,702 ft. after 500 gal. acid. Well was plugged back from total depth of 2,705 ft. to 2,702 ft.

W. F. Stucker 1 Sanders, 17-7n-10w, Sullivan County, is testing gas show in Pennsylvanian at 680-90 ft. Total depth is 690 ft.

INDIANA SUCCESSFUL WILDCATS

Gibson County: Ashland Oil & Refining Co. 1 Bender, SW NW NE 36-3s-12w, IP 70 bbl., McClosky pay 2,539-43 ft., TD 2,551 ft., acid 3,000 gal.

Knox County: Ledbetter and Ashland Oil & Refining 1 Elkins, NW SW NW 12-1s-12w, IP 93 bbl., Benoist pay 2,156-61 ft., TD 2,164 ft., discovery well Orriville pool.

INDIANA WILDCAT FAILURES

Sullivan County: Dittman-Ormiston 1 Ormiston, NW SW SE 33-8n-10w, dry at 1,750 ft.

Vigo County: H. M. Gray 1 Fee, SE SE SW 8-10n-10w, dry at about 1,000 ft.

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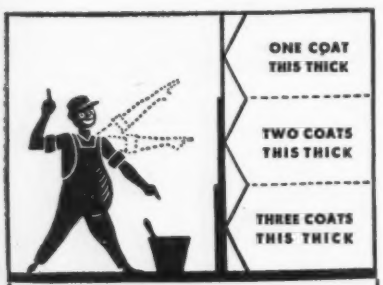

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ROCKY MOUNTAIN

Elk Basin Continues As Livest Area

DENVER.—The Elk Basin area on the Wyoming-Montana boundary continues to be the outstanding development of the week. Sinclair-Wyoming Oil Co. 1 Wilkins, NW SW NW 28-9s-23e, Northwest Elk Basin, in Carbon County, Montana, which opens a new pool, flowed 745 bbl. of 32°-gravity oil through 5/16-in. choke on 2½-in. tubing in 11 hours after being acidized. It was then shut in on account of storage being full. Total depth is 6,795 ft., top of Madison 6,215 ft., and 7-in. at 6,373 ft. Ground elevation is 4,470 ft. Tubing is at 6,778 ft. The test definitely establishes large reserves in the Madison lime, and may prove to be more important than the discovery of a new pool. Location is 1¼ miles northwest of nearest Tensleep well in Elk Basin proper.

A number of geologists express the belief that the fault which separates the new pool from the field proper may have disappeared before reaching the base of the Tensleep, in which event the Madison may prove to be a blanket horizon extending throughout the area. Seaboard Oil Co. has made a location 1½ miles northwest of the Wilkins well on a 1,280-acre block assembled by Julius Peters, of Great Falls, in 88-19 Government, SE SE SE 19-9s-23e. It will go to the Frontier at around 5,000 ft., and possibly to the Madison at 8,500 ft.

Stanolind Oil & Gas Co. 95 Unit, NE NW SE 31-58n-99w, Elk Basin, 2 miles south and ¾ mile east of the Elk Basin Madison lime discovery, and 5 miles southeast of the Wilkins well, made 1,710 ft. of clean oil and 410 ft. of oil-cut mud in 30 minutes on the third drill-stem test at 5,379-98 ft. Top of the Madison was at 5,029 ft. In a previous test at 5,206-87 ft. it flowed 20 bbl. of oil in 7 minutes after filling up in 53 minutes. It was 369 ft. in the Madison on the last test. The Madison discovery 2 miles to the north had 600 ft. of unbroken formation showing no water penetration after cutting 150 ft. of light saturation. The Elk Basin unit in the Tensleep horizon comprises 17,784 acres. Operators estimate that the two Madison wells prove up at least 75 per cent of the productive area in the Tensleep in the deeper formation. Another well to the Madison will be drilled lower down on structure to determine the water line.

Church Buttes.—Mountain Fuel Supply Co. 3 Unit, NE SW NE 12-16n-113w, Church Buttes field, Uinta County, Wyoming, 1½ miles west of the discovery, is testing for final completion at 13,060 ft., total depth. No official statement has yet been issued as to formation tops or results of the tests, but from other sources it is reported that in one test it made around 8,000,000 cu. ft. of gas through a ¼-in. choke with ½ gal. of distillate per 1,000 cu. ft. of gas. On another test it was reported to have increased to around 9,000,000 cu. ft. and on a third to have made 12,800,000 cu. ft. The 2 Unit, NE NE NE 22-17n-112w, 4¾ miles

(Continued on page 179)

LEGAL

OIL AND GAS LEASE

UNITED STATES DEPARTMENT OF AGRICULTURE, Farmers Home Administration, Dallas, Texas. Sealed bids in duplicate will be received until 2:00 p.m. (CST) September 10, 1947, and then publicly opened, offering bonus for operating rights in connection with gas and oil leases on 1,440 acres of land, more or less, located at Wichita Valley Farms, Wichita County, Texas. Award of lease will be made only to bidder who can show sufficient experience and financial resources and prove citizenship. Interested parties may obtain bid documents, lease forms and operating regulations from Area Chief, Administrative Services Division, Farmers Home Administration, 2007 McKinney Avenue, Dallas, Texas.

Among the

Drilling Contractors

Charter Issued Oklahoma City Drilling Company

Anderson-Carey Drilling Co., Oklahoma City, has been issued a charter by the secretary of state for Oklahoma. The concern was incorporated at $150,000 by C. V. Carey, Shawnee; Carl B. Anderson, Jackson, Miss.; and Edward Spiers, Oklahoma City.

Snyder & Head, Calgary, Alta., have contract for Pacific Petroleums 24-B, NW 9, 7-19-11w4, in Steveville-Princess field.

Goldrus Drilling Co., Houston, will attempt to extend production 650 ft. northerly at Boling, Wharton County, Texas, on the northwest flank. The 1 Mrs. Bertha Schendel will be drilled to 5,500 ft.

Stice Drilling Co. is moving in to drill Edwin B. Cox & J. L. Hamon 1 J. R. Murphy, wildcat test, located 8 miles east of Green in Karnes County, Texas. Contract depth is 5,000 ft.

C-G Drilling Co. is making hole on a test for Musgrove Petroleum Co. and Jones & Shelburne, the 1 Lanterman, NW NW NW 23-22-12, Stafford County, Kansas.

Commonwealth Drilling Co., Calgary, Alta., is placing two additional rigs in Lloydminster field, where it recently completed two successful tests, Commoil-Lloyd 5, NW 7, 16-50-2w4, and Command-Globe 6, NW 8, 15-47-27w3. The company is finishing Command-Loptson 1, NW 7, 16-50-1w4, and H.N.B. 1, NE 8, 10-49-27w3.

Wayne Drilling Co., Carmi, Ill., has staked location for its 1 Irwin, S½ SE NW 12-2n-73, Clay County, Illinois.

Nicklos Drilling Co., Houston, has contract to drill Continental Oil Co. 1 Jeanerette Roos Haas et al, a northeast extension test for Reddell field, Evangeline Parish, Louisiana. Contract depth is 10,000 ft.

Big Chief Drilling Co., Oklahoma City, et al., are starting a 4,800-ft. test in Oklahoma County, Oklahoma. The wildcat is the 2 Davis, SE SE SW 22-13n-1e.

General Petroleums, Calgary, Alta., has contract with Superior Oils to drill two additional tests on a quarter section recently acquired by the company and offsetting its present eight producers to the northeast.

H. Park is drilling a Spencer County, Indiana, wildcat for R. Hal Compton, the 1 John Schwartz, 100 ft. north and 522 ft. from west lines, NE NW 7-6s-4w.

Regent Drilling Co., Calgary, Alta., has received contract for completion

Tool pushers, drillers, and roughnecks study drilling-mud control in a short course held at Odessa, Tex. A series of such courses is currently being sponsored throughout the state by the American Association of Oilwell Drilling Contractors, Texas State Board of Vocational Education, and University of Texas

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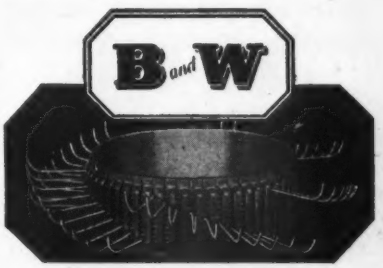

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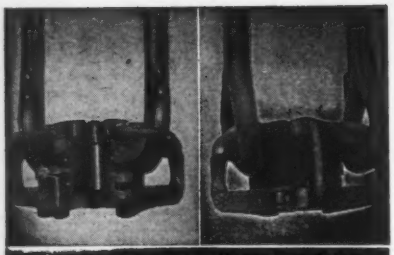

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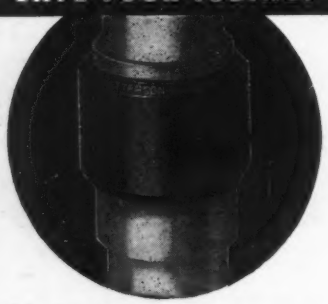
SAVE YOUR TUBING!



Tubing collars worn by contact with casing steal the profit out of pumping. Patterson-Ballagh Plastic Tubing Protectors prevent both collar and casing wear. Oil-proof, wear-resistant, insulating. They are pressed onto the collar under pressure and will not come off. Made in all sizes. End your tubing troubles. CALL in your Patterson-Ballagh man.

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of Kitalta Oils Shunda B-1, LSD 5, 20-55-20w4, in the Bruderheim area north and east of Leduc field. Contractors are rigging to resume from 2,525 ft. for a test of the Devonian limestone, expected at 3,250 ft.

Camay Drilling Co., Los Angeles, has just completed Adams Oil Co. 3 Morganti, Casmalia field, Santa Barbara County, California.

Barlow Brothers have completed a producer, the Franco-Oil & Gas 5, NW LSD 5, 14-47-27w3, Lloydminster-Lone Rock area, Alberta, with a total depth of 1,879 ft. and the Sparky oil zone at 1,854 ft.

Gilliam Drilling Co., Evansville, is drilling a wildcat in Webster County, Kentucky, its 1 Johnson, 1,200 ft. from north and 300 ft. from west line, 11-N-23.

Paul Doran, Vandalia, Ill., has brought in a producer for H. F. Robison, the 2 Charles Kneff, SE SW SE 16-3n-7e, Clay County, Illinois. The well flowed 1,012 bbl. oil in 27 hours from total depth of 2,964 ft.

Thorne Drilling Co., Henderson, has set surface pipe on a Union County, Kentucky, wildcat for Sam Malis, the 1 G. W. Buckman, 21-P-20.

Workover, Inc., will drill Pan American Production Co. 31-B Laws Realty Co., in Charenton field, St. Mary Parish, Louisiana, to a depth of 2,000 ft.

Moran Brothers Drilling Co. has rotary rig up for Stanolind Oil & Gas Co. 1 Mrs. F. M. Richards, a 6,500-ft. wildcat located north of the town of Swearington, Cottle County, North Texas.

Noble Drilling Co. has contract to drill The California Co. 4 State Lease 458, in Stella field of Plaquemines Parish, Louisiana. Contract depth is 7,500 ft.

Dixie Drilling Co. will drill Stanolind Oil & Gas Co. 1 H. C. Bucklin, a wildcat test in South Elton area of Jefferson Davis Parish, Louisiana, to a depth of 10,000 ft.

O. W. Dyer has contract to drill Magnolia Petroleum Co. 47 Cameron Meadows Land Co., in Cameron Meadow field of Cameron Parish, Louisiana. Contract depth is 12,000 ft.

Morrison Drilling Co., Eldorado, has drilling under way at Eldorado Refining Co. 1 Archer, NW NW SW 16-19-14, a test 1 mile south of Merten pool, Barton County, Kansas.

William Wise Drilling Co. has work under way at Morris Coats 1 Fred Fowler, a Woodbine sand wildcat 4 miles northwest of Jacksonville, Cherokee County, East Texas. Location is on a farmout from Phillips Petroleum Co. Derrick was being moved from Delta Drilling Co. and Wise 1 Ross, a Woodbine failure north of production in the William Wise field.

Shaw Petroleums, Lloydminster, Sask., are finishing Athlone 8, SE 6, 11-50-2w4, in the prolific northwest extension of Lloydminster field.

H. E. R. Drilling Co. has built derrick for a wildcat west of Mehan pool, Payne County, Oklahoma. The test is 1 Carl Johnson, NW NW SW 29-18n-3e, and is on a 1,200-acre block.

USE 'BESTOLIFE IT'S BETTER

'BESTOLIFE—the Lead Seal Joint Compound used successfully in the Drilling and Refining Industries for years—is immediately available through more than 100 distributors in the U.S.A.

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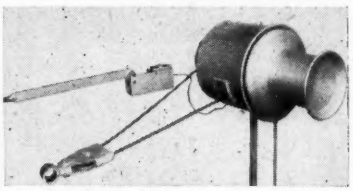
KELCO Safety

BREAKOUT CATHEAD



The KelCo Safety Friction Type Breakout Cathead is designed to greatly reduce the breakout shock loads on drawworks, drill pipe and the cathead itself.

The tong line runs through a self-aligning sheave. This feature was designed for the modern high speed rigs to slow down the tong line giving the operator positive control in breaking the joint.

Parts 95% interchangeable with KelCo Spinning Line Cathead.

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Drop-Forged • Heat Treated • 2 Sizes
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Malleable Iron • Heat Treated • 5 Sizes
MIDGET No. 1—1 swivel, 1/4" chain
DEI-TA No. 1—1 swivel, 1/4 or 3/8" chain
DIXIE No. 1—2 swivels, 1/4 or 1/2" chain
LONE STAR 1—2 swivels, 1/4, 1/2 or 3/8" chain
LONE STAR 2—2 swivels, 1/2, 1/2 or 5/8" chain

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STANDCO BRAKE LINING
For the easiest brake known. It feeds off evenly. Standco never scores brake rims. See pages 3608-3613, Composite Catalog.
Standco Brake Lining Co.
HOUSTON

It will be carried to the Wilcox expected at 4,700 ft. H. E. R.'s tools will be moved in after completing Continental Oil Co. et al 3 Greer, SW NW SW 24-23n-1w, southeast Ceres pool, Noble County, Oklahoma.

T. P. Pike Drilling Co., Los Angeles, has contract to drill the Union Oil Co. 111 Callender, 33-3s-13w, in Dominguez field of Los Angeles County, California.

Gilliam Drilling Co., Evansville, has locations for two Marion County, Illinois, wells. They are 1 W. C. Frye "A," NE NW SW 11-2n-4e, and 1 W. C. Fyre Community, SW SE SW 11-2n-4e.

S. McIntosh is making hole on a Felmont Corp. wildcat in Daviess County, Kentucky, the 1 Dave Rolland, 4-N-32, 1½ miles southwest of Whitesville.

Lebow & McNee, Torrance, Calif., have spudded Mutual Development Corp. 1 Lassalle, a wildcat in 10-3n-16w, Newhall-Potrero area, Los Angeles County, California. Location is on a 1,290-acre block midway between Newhall-Potrero and Aliso Canyon fields. Northeast of Mutual's location, Union Oil Co.'s 12,000-ft. test, drilled jointly with General Exploration Co., is reported to have picked up 200 ft. of well-saturated oil sand at a depth of 8,800 ft.

Basin Drilling Co., Owensboro, is drilling two wells in partnership with Sohio Petroleum Co. in Union County, Kentucky. They are 6 M. Robinson, NE SW SE 11-P-19, and 8 M. Robinson, SE NW SE 11-P-19.

K. L. Kellogg & Sons, Long Beach, who have recently moved to new quarters at 15814 South Avalon Boulevard, Compton, Calif., have received contract to drill 3-1 Bixby for Continental Oil Co. at Seal Beach, Calif.

Drilling Contractors, Ltd., Calgary, Alta., who have already completed Imperial 4, 6, and 7 in Leduc field, have spudded Imperial 13, LSD 4, 23-50-26w4, and have contract for Imperial 14, LSD 9, 26-50-26w4, an offset to No. 3 producer. The same company is drilling two tests, Home 27, LSD 16, 18-21-3w5, and Home 28, LSD 10, 18-21-3w5, both in Turner Valley north extension, for Home Oil Co., Ltd.

Harbar Drilling Co., Wichita, and Phil Polhamus have gotten a good show of oil in a Rooks County, Kansas, test. The wildcat is the 1 Baumgarten, NE NE NE 25-9-19, and the Arbuckle was reached at 3,633 ft. Harbar is also preparing to drill a test 4 miles west of Stoops pool in Pratt County, Kansas, the 1 Keller, SE SE NW 16-29-13.

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• SUSTAINED PUMPING CAPACITY
• PUMP DEPENDABILITY

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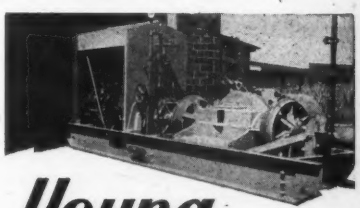

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STATISTICS and

WEEKLY WELL COMPLETIONS . . . WEEK ENDED AUGUST 16, 1947

	Total of all wells					Cum.		Wildcat completions and discoveries					Cumulative total, 1947				
	Comp.	Oil	Gas	Dry	Footage	1947	1946	Oil	Dist.	Gas	Dry	Total	Oil	Dist.	Gas	Dry	Total
New York	43	22	0	*21	57,191	963	985	0	0	0	0	0	3	0	0	2	5
Pennsylvania	70	33	9	†28	117,516	1,796	2,487	0	0	0	0	0	0	0	2	1	3
West Virginia	22	5	16	1	61,937	517	442	0	0	1	1	2	0	0	10	5	15
Ohio	28	8	9	‡11	91,879	809	749	0	0	0	0	0	0	0	3	30	33
Indiana	8	4	0	4	14,003	390	222	2	0	0	2	4	17	0	0	32	49
Kentucky	25	6	9	10	43,549	408	304	0	0	0	1	1	6	0	0	29	35
Illinois	49	21	0	28	136,211	1,243	1,368	1	0	0	12	13	45	0	1	220	266
Michigan	27	11	3	13	60,599	519	502	0	0	1	6	7	5	0	10	132	147
Kansas	63	27	9	27	211,312	1,595	1,227	1	0	0	13	14	27	0	11	212	250
Neb., Mo., Iowa	1	0	0	1	3,604	4	12	0	0	0	1	1	0	0	0	4	4
Oklahoma	71	41	6	‡24	220,119	2,533	1,620	0	0	0	8	8	59	3	9	426	497
Texas	203	123	15	65	853,013	5,573	4,981	10	0	3	28	41	186	32	59	829	1,106
North Central (Dist. 7-B & 9)	69	37	4	28	186,232	1,813	1,801	1	0	1	7	9	59	0	8	281	348
West (Dist. 7-C & 8)	54	46	1	7	250,733	1,332	1,062	2	0	0	4	6	20	0	3	101	124
Panhandle (Dist. 10)	7	6	0	1	21,425	266	208	0	0	0	0	0	1	0	1	5	7
Eastern (Dist. 5 & 6)	13	5	1	7	73,763	315	448	1	0	0	4	5	5	0	4	70	79
Gulf Coast (Dist. 3)	31	18	4	9	190,121	974	1,089	2	0	1	7	10	48	24	25	172	269
Southwest (Dist. 1, 2, & 4)	29	11	5	13	130,739	873	373	4	0	1	6	11	53	8	18	200	279
Louisiana	39	29	1	9	181,773	857	825	0	3	0	3	6	22	15	9	121	167
Northern	23	17	1	5	40,894	480	457	0	0	0	2	2	3	1	3	71	78
Southern	16	12	0	4	140,879	377	368	0	3	0	1	4	19	14	6	50	89
Arkansas	6	5	0	1	20,829	164	110	0	0	0	1	1	1	0	0	31	32
Mississippi	9	5	2	2	75,758	300	153	0	0	0	1	1	0	0	1	58	59
Southeastern States	3	0	0	3	21,569	37	27	0	0	0	2	2	0	0	0	32	32
Montana	4	3	1	0	10,700	160	189	0	0	0	0	0	2	0	5	14	21
Wyoming	4	1	1	2	26,120	137	106	0	0	0	1	1	7	0	2	21	30
Colorado-Utah	7	7	0	0	44,736	126	89	0	0	0	0	0	2	0	1	33	36
New Mexico	11	4	1	6	34,053	327	229	0	0	0	1	1	4	0	1	22	27
California	29	27	0	2	143,647	1,212	1,087	2	0	0	2	4	34	0	5	175	214
Total United States	722	382	82	258	2,430,118	19,670	17,714	16	3	5	83	107	420	50	129	2,429	3,028
Total previous week	781	411	72	298	2,510,793	18,948	17,203	24	1	5	95	125	404	47	124	2,346	2,921
Total August 17, 1946	511	289	44	178	1,716,538			9	0	4	61	74	321	27	79	2,060	2,487

Service wells included: *21, †23, ‡1.

CRUDE PRICES AND REFINERY ACTIVITY

GRAVITY SCHEDULES

Top prices include all gravities above grades designated, and low prices include all gravities below grades designated:

Gravity—	Signal Hill, Calif.*	Oklahoma, Kansas	Gulf Coast Tex.†	West Tex.‡
18-18.9	$1.60	....	....	....
19-19.9	1.65	....	....	....
20-20.9	1.69	$1.55	....	$1.43
21-21.9	1.73	1.57	....	1.44
22-22.9	1.77	1.59	....	1.46
23-23.9	1.80	1.61	....	1.48
24-24.9	1.84	1.63	$1.86	1.50
25-25.9	1.88	1.65	1.88	1.52
26-26.9	1.91	1.67	1.90	1.54
27-27.9	1.95	1.69	1.92	1.56
28-28.9	1.99	1.71	1.94	1.58
29-29.9	2.02	1.73	1.96	1.60
30-30.9	2.06	1.75	1.98	1.62
31-31.9	....	1.77	2.00	1.64
32-32.9	....	1.79	2.02	1.66
33-33.9	....	1.81	2.04	1.68
34-34.9	....	1.83	2.06	1.70
35-35.9	....	1.85	2.08	1.72
36-36.9	....	1.87	2.10	1.74
37-37.9	....	1.89	2.12	1.76
38-38.9	....	1.91	2.14	1.78
39-39.9	....	1.93	2.16	1.80
40 and above	....	1.95	2.18	1.82

*Standard Oil Co. of Calif. posting. †For crude from Daboval, El Campo, and Sandy Point. ‡Includes Lea County, New Mexico.

A.P.I. REFINERY REPORT, WEEK ENDED AUGUST 9

(Thousands of barrels)

District—	Crude runs, daily avg.	Production: Gasoline†	Kerosine	Gas & dist. oil	Residual	Stocks at refineries, bulk terminals, in transit and in pipe lines: Gasoline*	Kerosine	Gas & dist. oil	Residual
East Coast	848	2,291	231	1,127	1,641	20,433	8,003	14,270	10,056
Appalachian:									
District 1	103	331	44	95	104	2,225	281	505	319
District 2	70	242	13	48	138	907	192	123	150
Ind., Ill., Ky.	860	2,992	308	809	1,052	15,342	2,270	5,501	4,312
Okla., Kans., Mo.	419	1,472	155	534	480	6,627	977	2,546	1,260
Inland Texas	242	1,008	94	140	442	3,090	450	495	831
Texas Gulf Coast	1,210	3,851	660	1,541	1,777	13,019	3,018	8,563	6,228
La. Gulf Coast	408	1,168	369	482	559	4,345	1,861	2,622	1,894
N. La. and Ark.	71	172	50	64	115	1,430	436	434	144
Rocky Mountain:									
New Mexico	10	42	3	11	19	83	14	25	34
Other Rocky Mtn.	139	388	9	138	209	2,360	145	787	720
California	804	2,206	28	943	2,221	15,037	915	13,674	27,583
August 9, 1947	5,184	16,163	1,964	5,932	8,757	84,898	18,562	49,545	53,531
August 2, 1947	5,271	16,517	‡2,043	6,004	8,582	85,645	17,665	‡48,574	53,107
August 10, 1946	4,784	15,156	1,899	5,517	7,995	87,186	17,111	49,057	51,925

*Finished and unfinished. †At refineries including natural blended. ‡Revised.

Bureau of Mines crude-oil stocks 227,779,000 bbl. as of August 9—down 3,690,000 bbl. One year ago 224,098,000 bbl.

FLAT CRUDE PRICES

Representative posted schedules per bbl.	
East Texas	$1.95
Kettleman Hills, California*	2.14
Beauregard Parish	1.90
Illinois Basin	2.07
Pecos County, Texas (Yates)	1.65
Bradford, Pennsylvania	4.30
Eastern Ill. and Western Ind.†	2.07
Tomball, Texas Gulf Coast	2.10

*37°-37.9°. †35° and above.

TRENDS

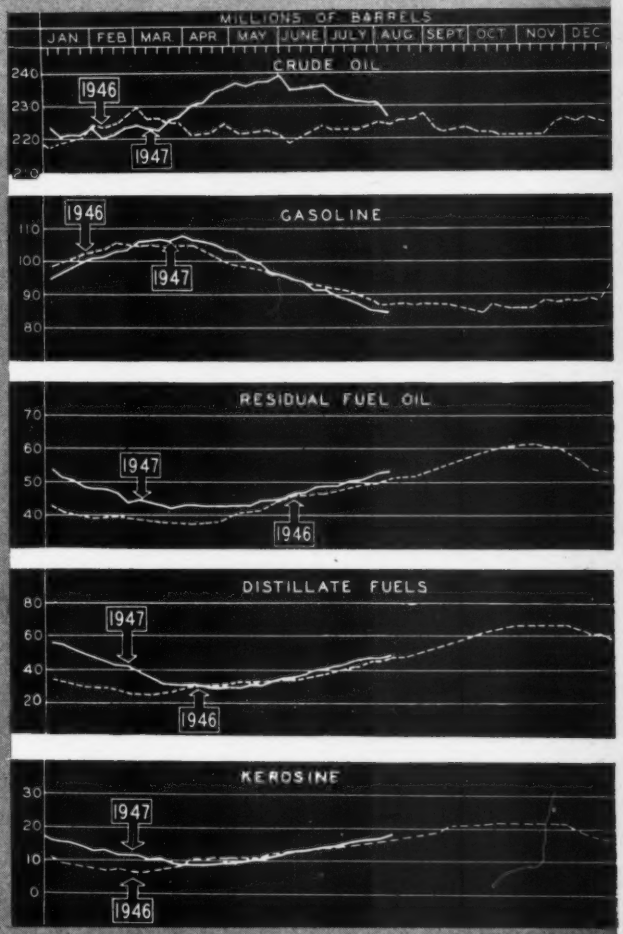
DAILY AVERAGE PRODUCTION FOR WEEK

	Aug. 16 crude oil	B. of M. Aug. demand	Aug. 9 crude oil
Alabama	1,200	1,200	1,200
Arkansas	82,400	81,000	82,100
California	925,700	920,000	920,800
Colorado	44,410	43,000	40,370
Eastern	63,500	65,400	66,800
Florida	1,000	800	1,000
Illinois	174,100	200,000	177,300
Indiana	15,950	18,000	17,800
Kansas	300,350	305,000	283,100
Kentucky	25,000	27,000	25,600
Louisiana	436,100	437,000	435,950
North Louisiana	106,050	.....	105,900
South Louisiana	330,050	.....	330,050
Michigan	47,140	45,000	41,915
Mississippi	98,355	96,000	99,955
Montana	24,110	24,000	22,950
Nebraska	550	600	500
New Mexico	107,950	106,000	107,950
Oklahoma	389,700	405,000	388,550
Texas	2,306,050	2,255,000	2,283,500
Dist. 1 (Southwest)	23,600	.....	23,430
Dist. 2 (Southwest)	161,175	.....	157,895
Dist. 4 (Southwest)	245,250	.....	235,800
Dist. 3 (Gulf Coast)	487,385	.....	484,730
Dist. 5 (Eastern)	39,480	.....	39,480
Dist. 6 (Eastern)	116,825	.....	113,825
East Texas field	324,000	.....	324,000
Dist. 7-C (West)	39,560	.....	39,375
Dist. 8 (West)	618,230	.....	617,075
Dist. 7-B (W. Central)	39,400	.....	39,000
Dist. 9 (N. Central)	127,525	.....	125,850
Dist. 10 (Panhandle)	83,620	.....	83,040
Wyoming	121,610	122,000	116,300
Total United States	*5,165,175	5,152,000	5,113,640
Change from prev. wk., up	51,535		

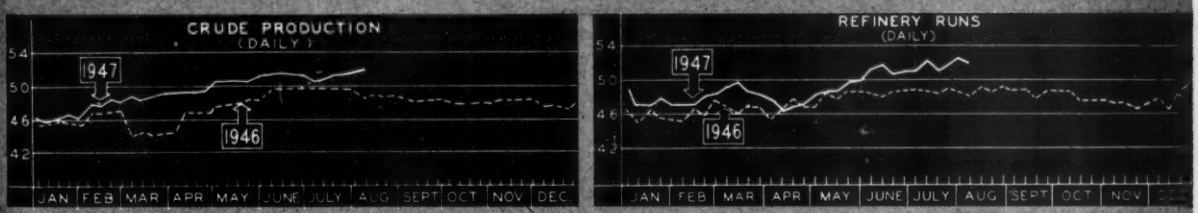
Total production January 1-August 16.. †1,131,077,235 bbl.
Same period last year (crude plus cond.) 1,077,888,005 bbl.

*Not incl. 41,165 bbl. condensate. †Incl. 6,871,230 bbl. condensate.

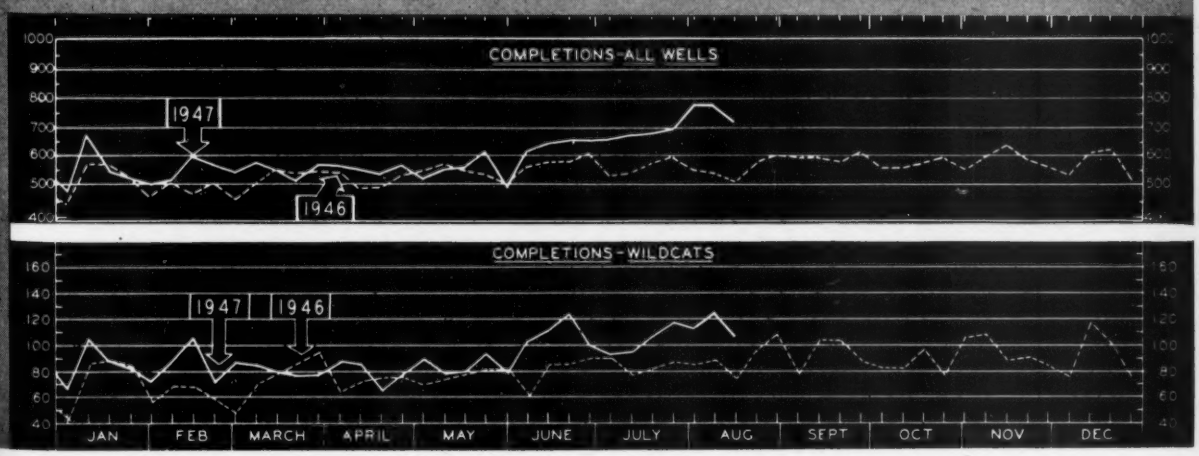
OIL STOCKS IN THE UNITED STATES

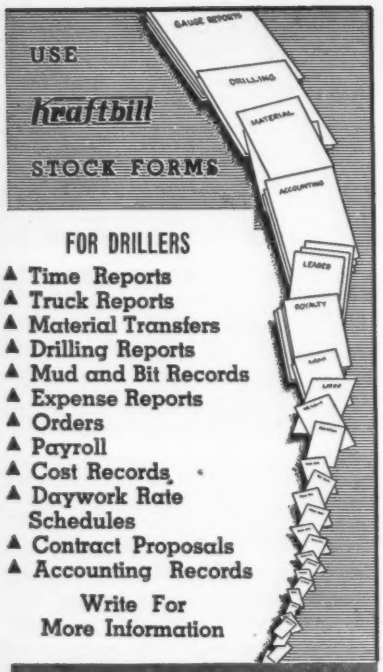


DAILY OPERATIONS



Solid line charts weekly completions, service wells in Eastern area included.





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MARKETS

A FURTHER ¼-cent increase in the price of natural gasoline highlighted the petroleum products spot market in the Mid-Continent area last week.

The increase, which originated in North Texas and was adopted immediately in the Group 3 area, boosted the 26-70 grade to 5⅝ cents a gallon North Texas and to 6⅛ in Group 3.

Gasoline grew scarcer during the week and its price moved higher in the Mid-Continent as a general dearth of offerings characterized the entire market.

One refiner reported he had turned down offers of 10¾ cents for regular grade gasoline for an aggregate of "more than 100 cars" because of a lack of material. No movement of any quantity were reported, although one supplier was reported offering a quantity of regular grade product for 9½ cents.

Tank Cars Short

Tank cars remained in short supply for many small refiners and suppliers, and reports were heard during the week of rental offers ranging from $20 to $40 a trip for cars by shippers in dire need of transportation. There was a feeling among many market observers that the supply of tank cars was better, but that many were tied up by major refiners and that the improvement in the general situation was not reflected in the operations of smaller operators.

Even with the slackening of gasoline demand expected in early September refiners were expecting no letup in orders, feeling that suppliers would continue their efforts to fill storage facilities and that the decreased consumer demand would have no effect on refiners for 45 to 60 days.

Along the Gulf Coast the situation was little changed from last week, with no large quantities of gasoline or other light products reported moved.

One large supplier said the spot market was temporarily nonexistent "because there's nothing available to move." Light burning oils, now going into storage, might be expected to reappear on the spot market "if and when storage is filled," he said.

Lubricants Available

Lubricating oils still were available and at the same prices. Talk still was heard, however, of a price increase in lubricants in the near future.

Deep Rock Oil Corp. last week announced a half-cent increase in its tank-wagon prices for range oil, domestic heating oil, and diesel fuel throughout its Midwest marketing area, attributing the increase to increases in wholesale costs.

Socony-Vacuum Oil Co., Inc., announced a similar increase in products in New Jersey, District of Columbia, Maryland, Virginia, West Virginia, and North and South Carolina, extending a recent increase made in New England areas.

Talk of a crude price increase still was heard in the industry, spurred last week by speeches of Ernest Thompson, chairman of the Texas Railroad Commission, and Walter S. Hallanan, president of Plymouth Oil Co.

Thompson declared there is "nothing wrong with the oil producing industry that pipe and price won't cure."

Representative Quotations

Representative spot-market quotations of leading suppliers as of August 18, 1947. Figures are f.o.b. plant for tank-car shipment in cents per gallon, except for residual fuel oil which shows the price per barrel and wax, in cents per pound.

GASOLINE, KEROSINE, AND FUEL OILS

	Mid-Continent Group 3	New York Harbor	Texas Gulf Coast
Regular gasoline, 73-75 octane	8.5-9.5	10.3-10.5* 9.3-9.5†	9-10
Premium gasoline, 78-89 octane	9.25-10.25	10.2-12	9.5-10.5
42-44 w.w. kerosine	7.5-7.75	7.8-8.1	7.5-8
No. 2 straw fuel oil	7.25-7.75	6.8-7.2	7.7.5
No. 6 residual	$2.15-2.50	$2.22-2.52	$2.00-2.75

*Branded (74-76 octane); †Unbranded (74-76 octane).

NATURAL GASOLINE

	Group 3	North Texas	N. La.
Grade 26-70	6.125	5.625	5.875
Grade 18-55	7.35	6.75	7.05

LUBRICATING OILS
South Texas

200 vis., No. 2-3 neutral	11.5-12.5
750 vis., No. 3-4 neutral	13.5-15.25
2,000, No. 5-6 neutral	15-16.75

LUBRICATING OILS
Mid-Continent

150-160 vis. D bright stock, 0-10 p.p.	20
200 vis. No. 3 neutral, 0-10 p.p.	18-19

Western Pennsylvania

145-155 vis. 10 p.t. bright stock	45
180 vis. 0 p.t. neutral	43

CRUDE-SCALE WAX
Mid-Continent

130-132 A.S.T.M. melting point	6.75-7.75

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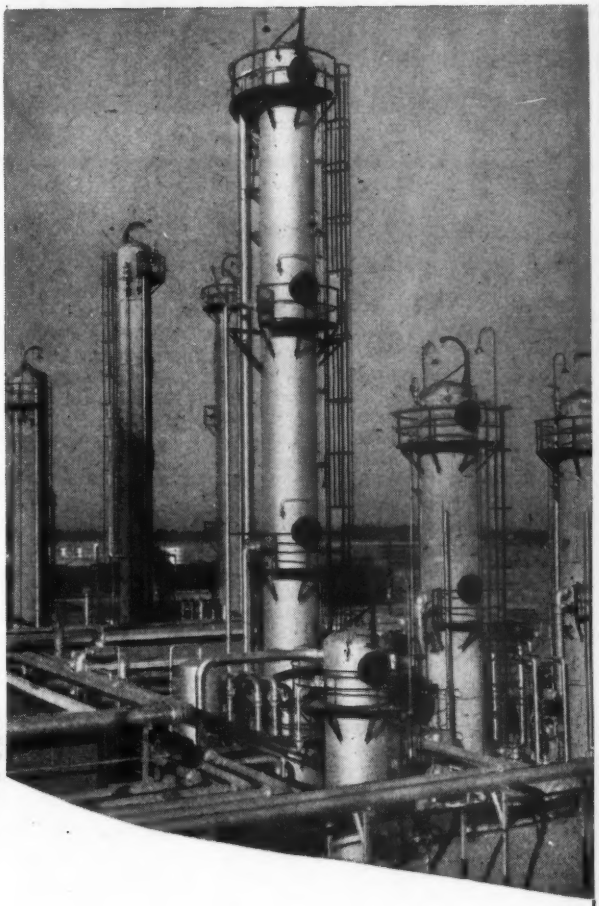

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EQUIPMENT MEN ... in the News

National Supply Inaugurates Training Program

National Supply Co. is inaugurating a personnel-training program for all its manufacturing plants, sales, and engineering departments, and company stores. Dr. B. E. Warden, former dean of students and director of student personnel at Carnegie Institute of Technology, has been appointed educational director, with headquarters in Pittsburgh.

Dow Celebrates Fiftieth Anniversary

Dow Chemical Co., celebrating its fiftieth anniversary this year, has recently released an interesting narrative "Fifty Years of the Dow Chemical Company, Its Progress and Its People." This booklet tells the story of Dow and the personnel who increased the company's products from 1 to more than 500 in five decades. The company's 50 years of progress is illustrative of industry to give to America the materials and service so that it will always remain a nation with the highest standard of living.

Edwards and Moran Elevated by Oil Center Tool

At a recent meeting of the board of directors of Oil Center Tool Co., Jack Edwards was made director of sales and John Moran was promoted from salesman to sales manager, the position vacated by Edwards. At the same meeting, David T. Searls of Houston was elected to the board of directors.

Buxton Elected Chairman

E. A. Buxton has been elected chairman of the committee on steel-pipe research of American Iron and Steel Institute. He succeeds E. P. Corey who has retired after 52 years in the steel-pipe industry. Corey served as chairman of the committee from its inception in 1942, and has been general manager of tubular sales for Youngstown Sheet & Tube Co. Buxton is sales manager, pipe and tubes, for the Bethlehem Steel Co. Oscar I. Strickland, manager of tubular sales for Wheeling Steel Corp., was elected vice chairman of the committee. The committee on steel-pipe research of American Iron and Steel Institute was established in 1942, to handle exclusively matters concerning steel pipe and to collaborate with the subcommittee on pipe of the committe on building codes of the institute.

Hopkins Named Executive Vice President

R-S Products Corp., Philadelphia, manufacturing engineers, announces promotion of David W. Hopkins, well-known consulting engineer, to executive vice president, giving him full administrative authority in the valve, furnace, and manufacturing division. Hopkins has been with the company since September 1939 and previous to his new position was in charge of its valve division.

Martinez in U. S.

Engineer Jose Ovidio Martinez, technical consultant for Langley Y Cia., S.R.L., Buenos Aires, arrived in New York August 10 for a 3-month business trip for the purpose of visiting the plants of the companies represented by the firm in Argentina, Chile, and Brazil. In addition to studying the technical and operating details of the equipment he will visit the major fields of the Mid-Continent, Gulf Coast, and California.

Laclede-Christy Purchases Osceola Plant

Laclede-Christy Clay Products Co., St. Louis, announces the purchase of all the capital stock of Osceola Silion & Firebrick Co. of Osceola Mills, Pa. Annual capacity of the plant is 10,000,000 fire brick. Albert B. Agnew has been appointed general manager of the Osceola company. He was associated with Harbison-Walker Refractories Co. for over 30 years, during which time he was superintendent of several plants in Pennsylvania and Chicago and in later years was attached to the general office in Pittsburgh.

Riley New District Governor

John R. Riley, president of Big Four Machine & Supply Co., Clay City, Ill., recently was elected district governor of Rotary International District 149. His election took place at the district conference held in Carmi, Ill. Riley has been active in Rotary for many years and his election is a fitting tribute to the contributions of time and work he has made to the organization.

Palmer Sales Manager Of Sperry-Sun

Arthur B. Palmer has been named general sales manager of Sperry-Sun Well Surveying Co. Palmer joined Sun Oil Co. as an engineer at Maracaibo, Venezuela, in 1922. He joined the Sperry-Sun Well organization as a sales and service engineer in 1929. Since 1938 he has been a district manager for the company with headquarters at Lafayette, La.

Cleborne Elected Executive Vice President

E. B. Cleborne, a vice president of Allegheny Ludlum Steel Corp. since 1938, has been elected executive vice president of the corporation by the board of directors.

Economy Electric Lantern To New Quarters

Economy Electric Lantern Co., Milwaukee, announces the construction of a new factory and office building in Sturgeon Bay, Wis., which is expected to be ready for occupancy September 15.

Mid-States Appoints Neil

Marshall E. Neil has been appointed general sales manager of Mid-States Equipment Corp. Neil, a registered professional engineer, has had 15 years of diversified experience in the marketing of varied lines of electrical equipment, including creative selling and sales management in consumer sales as well as dealer distribution.

Brown Names New Sales Engineers

Brown Instrument Co. has assigned a new group of sales engineers to branch and regional offices. The new appointees are graduate engineers who have completed postgraduate courses at the Brown School of Instrumentation at Philadelphia. Those appointed and the cities to which each will be assigned are: Edgar Andrews, Atlanta; Nilsson S. Bassett, Boston; R. J. Bierman and Clarence W. Swanson, Minneapolis; Edward J. Bryne, Houston; Warren H. Erftenback, Buffalo; David J. Fair, Dallas; William R. Hamaker, Detroit; Charles F. Hintz, Chicago; Lawrence W. King, New York; Donald W. Larcen, Milwaukee; John F. Smith, Tulsa, and Andrew H. Albee, Cleveland.

International Harvester Adds Space

Farmall Works, International Harvester Co.'s Rock Island tractor plant, is planning an addition to its present manufacturing space. L. M. Gildes, works manager of the plant, announces that the new steel and brick building will add 72,600 sq. ft. of space to the present manufacturing building. Present plans call for completion of the work and beginning of operations late in the spring of 1948.

Brown Moved to New York

B. V. Brown has been transferred to the New York City office of International Derrick & Equipment Co. He will handle sales of products that supplement the equipment manufactured by Ideco from the export office in the Chanin Building in New York. Brown was formerly manager of purchasing and stock control, Ideco supply stores, Dallas, and has been with the company since 1943.

Shifts in Continental Supply

Continental Supply Co., Dallas, announces the following recent personnel changes in the organization: N. K. Keller, former field salesman at Kermit, Tex., has been appointed store manager at the same location.

Richard E. Scheibel, former bookkeeper at Lake Charles, La., has been transferred to Eunice, La., as store manager.

R. B. Ball, former field salesman at Oklahoma City branch store, has been transferred to Russell, Kans., as store manager.

G. R. Pike, former store manager at Russell, Kans., has been transferred to Hobbs, N. M., as field salesman.

Clyde E. Wade, former manager at Eunice, La., has been transferred to Lake Charles branch store as salesman.

Byron Lasseter, former assistant store manager at Artesia, Colo., has been appointed store manager at the same location.

R. W. Griffin, former store manager at Artesia, Colo., has been transferred to Casper, Wyo., in the same capacity.

Solvay Sales Makes Two Address Changes

Two changes in address have been announced by Solvay Sales Corp., New York. The new Houston address of the firm is 1313 City National Bank Building, 921 Main Street; the New Orleans address is 1107 Pere Marquette Building, Baronne Street. S. O. Taylor manages the Houston office, and Carl Kinsburg is manager of the New Orleans office.

Unit Rig Names Ramey

Unit Rig & Equipment Co. has announced appointment of T. A. "Tom" Ramey as sales manager. For the past 13 years Ramey has been connected with National Supply Co., and comes to Tulsa from Fort Worth, where he more recently served as manager of sales and service in the rotary drilling equipment division. He graduated from University of Southern California in petroleum engineering and is a member of American Institute of Mining and Metallurgical Engineers.

Calco Names Cooper

Dr. H. B. H. Cooper has been appointed as assistant manager of the development department of Calco Chemical division, American Cyanamid Co., Bound Brook, N. J. Dr. Cooper, a native of the Canal Zone, is a graduate of Iowa State College in chemical engineering. He joined the chemical engineering section of the Calco research department in 1942. Prior to his present apointment, Dr. Cooper held the position of divisional engineer of the rubber chemicals, pharmaceuticals, and coal-tar-productsc refining divisions.

Stanton to Philadelphia

Charles Stanton has been appointed district field engineer in the Philadelphia office of Chain Belt Co., Milwaukee. He formerly held a similar position in the company's Detroit office.

Castelli Named Representative For Houdry

Dr. Luigi G. Castelli, prominent South American business man and authority on petroleum refining, has been named South American representative for Houdry Process Corp. The new representative, whose headquarters are in Buenos Aires, Argentina, has had extensive experience in the petroleum and industrial fields. He has been connected with the engineering department of Public Service Corp. of New Jersey; he has served as consulting engineer in charge of foreign business for Seabrook Engineering Corp.; and has been general Latin-American representative for Lummus Co. He is owner of Etablicimientos Mecanicos Castelli —rolling mills; vice president of the White and Blue Lloyd, shipping lines; consulting engineer for Indo, S.A., linseed oil plant; and a director of the Loleri Ship yard.

Kidwell and Jenkins Appointed by Goodrich

Two appointments in the truck and bus-tire sales department of B. F. Goodrich Co. are: Howard F. Kidwell, who will be in charge of fleet sales including national-account sales and state business, and Thomas I. Jenkins, who will be in charge of industrial tire sales.

ACF Names Eaton

Frederick H. Eaton has been appointed assistant vice president of American Car & Foundry Export Co. He had previously been connected with A.C.F. as assistant to the vice president in the New York sales office. L. B. Chapman, formerly connected with the company's marine division, has been appointed assistant manager, valve division, in the New York sales office. H. P. Ackerman, formerly assistant manager of sales promotion in the eastern states, has been appointed general sales representative of the valve division.

Three Shifts in Goodyear

R. E. Pauley, district manager at Pittsburgh, becomes sales manager of Goodyear Tire & Rubber Co.'s molded-goods plant at St. Marys, Ohio. He is succeeded by Robert B. Warren, who has been eastern railroad sales manager in New York City. Howard T. Martin has been named district manager of mechanical goods sales at Dallas.

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